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Contents.

Lecture to the Institute—

"The Outlook in Tropical Hygiene," by Andrew Balfour, C.B., C.M.G., M.D., B.Sc. 1

Sessional Meetings—

"Central Heating in Relation to Domestic and other Dwellings," by A. H. Barker, B.A., B.Sc. 15

"The Sanitation of Places of Public Entertainment," by W. Allen Daley M.D., B.A., B.Sc., D.P.H. 34

"Conversion of Pail Closets to Water Closets," by A. T. Gooseman, M.Inst.C.E. 43

"Economy in Sanitary Appliances and Methods of Drainage," by Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A. 48

Supplement—

Reviews of Books 1
Meetings held 5
Dominion and Foreign Notes 7
Forthcoming Meetings 8
Bournemouth Congress 9
Elections 12
Obituary 15

LIST OF ADVERTISERS.

The numeral indicates the page on which the Advertisement appears; the dash (——) denotes that Advertisement is not in this issue.

Activated Sludge, Ltd. ... xx
Balliere, Tindall & Cox ... —
Berkefeld Filter Co. (British) vi
British Commercial Gas Assn. xvi
British Electrical Development Assn .xiv
Broad & Co., Ltd. viii
Building Products Limited ... —
Burn Bros. ix
Cadbury Bros., Ltd. vi
Candy Filter Co., Ltd. ... vi
Cambridge University Press ... xiii
Churchill, J. & A. ... ... —
Claughton Bros., Ltd. ... x
Constable & Co., Ltd. ... —
Crapper, Thomas & Co., Ltd. vii
Doulton & Co., Ltd. ... v
Educational Supply Assn., Ltd. —
Electricars, Ltd. ... ... —
Elsan Toilet Co. xvii
Evans Sons, Lescher & Webb, Ltd. —
Flavel, Sidney, & Co., Ltd. ... xxi
"Glaxo" iv
Grampian Engineering Co., Ltd. —
Harley, T. xiii
Harrison, G. W. & Co. ... viii
Horlick's Malted Milk ... i
Jackson, Elphick & Co., Ltd.... —
Jennings, George, Ltd. ... vii
Jones & Attwood Ltd. ... xvi
Kay Bros., Ltd. ... ... —
Kerner-Greenwood & Co. ... —
Lewis, H. K., & Co., Ltd. ... xiv
London Warming Co., Ltd. ... —
Longmans, Green & Co. ... —
Lysol, Ltd. ... ... —
Macfarlane, Walter, & Co. ... xix
Manlove, Alliott & Co., Ltd.... xii
Murray, John ... ... —
Newton, Chambers & Co., Ltd. i
Norfolk Hotel, Bournemouth ... iii
O. Bruster & De Launoit ... iii
Pontifex, H. & Sons, Ltd. ... xv
"Ronuk," Ltd.... iii
Royal Society for the Prevention of Cruelty to Animals ... xviii
Sankey, J. H., & Son, Ltd.... ix
Septic Tank Co., Ltd. ... —
Silicate Paint Co. iv
Slack & Brownlow iv
Tintometer, Ltd. xvii
United Alkali Co., Ltd. ... xi

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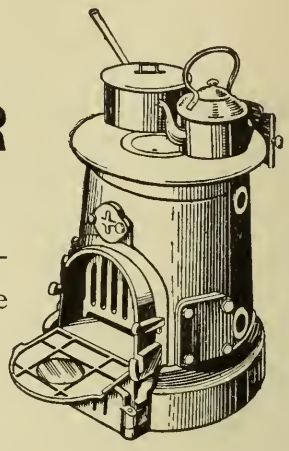

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The Outlook in Tropical Hygiene, by ANDREW BALFOUR, C.B., C.M.G., M.D., B.Sc. (FELLOW), Director-in-Chief, Wellcome Bureau of Scientific Research.

Lecture to the Institute, Wednesday, April 26th, 1922.

I HAVE chosen this subject because it will enable me to say something about the practical application of our existing knowledge to the problems of hygiene and sanitation which confront us, a matter with which I trust this Institute will soon be intimately concerned.

The future of tropical hygiene depends upon research. Such a statement is doubtless a truism, but I fear its truth is, even in these days, not fully appreciated. Just as in the treatment of disease empiricism has often exercised a baneful influence, so in its prevention measures have from time to time been applied based on no sure foundation, and the result has been disappointing both from the hygienic and the administrative standpoint. Take, for example, the long-continued use of lime juice as a prophylactic in scurvy. Countless gallons of this beverage have been consumed, chiefly by soldiers and sailors, and though doubtless some benefit has accrued, for it contains a modicum of anti-scorbutic vitamine, yet recent research has shown that our faith should have been placed in the kindred lemon juice, which was the substance originally introduced into the Navy for combating the fell disease of sailing ships, but for which the juice of the lime was substituted, probably without thought, and certainly without sound scientific approval.

Again, consider how much time and money has been spent on so-called disinfectants. Long ago, when working in Cambridgeshire, I used to be amazed at the liberal distribution of tins of disinfectant to households plagued by diphtheria and enteric fever. Even then I used to wonder what possible service they could render beyond camouflaging the odour of some privy midden, but they were received with thankfulness, and, possibly, even employed. It was not until Barlow, in 1910, raised his voice and testified against some of the absurdities of fumigation and the indiscriminate use of evil-smelling powders and equally malodorous fluids that the general belief in such measures was shaken. Yet even now, despite the careful observations of Walcott and Curtis in the United States and the mass of evidence

which has accumulated, there are high priests of fumigation who burn sulphur upon the altar of hygiene and strew disinfecting powders broadcast as did others in the Middle Ages.

Pray do not think that I wish to decry the value of disinfection and of disinfectants. I fulminate merely against the unwise use of the latter, the tendency to disregard the rôle of the patient and his immediate surroundings in spreading infection, and to forget, more especially in the tropics, the value of fresh air and sunlight as microbicidal agents.

Empiricism dies hard, and it is strange how slowly scientific knowledge spreads, even in the presence of an all-powerful Press and when the facilities for the diffusion of information have increased a thousandfold.

But recently a gentleman in Mauritius gravely assured me that the appearance of malaria in that island coincided with the introduction of guano from South America, and that this fever was undoubtedly due to the pernicious habit of manuring the cane fields with the dung of petrels and of penguins.

Another, interested in the failure of the sewers of Port Louis to function in an efficient manner, a failure due to a faulty fall and deficient pumping power, seriously suggested that all would be well if, by a solution of soap, the interiors of the pipes were well lubricated in a manner similar to that employed by the fashionable physician for the treatment of constipation.

One may pardon the laity, for, apart from the lack of training, they suffer because Medicine has often spoken with an uncertain voice. Theories have taken the place of facts, and, while it would be a sad world without theories, a world ruled by them would become a place to excite the compassion and lachrymation of angels.

Still, there can be no doubt that amongst civilised and enlightened communities great progress has been made, and the man in the street can generally discuss in an intelligent manner the etiology of the chief communicable diseases to which he is likely to fall a victim, and has some acquaintance with methods of prevention and cure. In short, education has now reached such a stage amongst the inhabitants of most countries in the temperate zone that it may truly be said of them they live to learn, the while they learn to live.

Very different, however are the conditions in the tropics. Though in many places there has undoubtedly been an awakening of late years, native populations, as a whole, still grope blindly under a pall of ignorance and superstition, and the most pressing need in all matters concerned with their sanitary progress is education. Such education, however, must be on right lines. In several of our Colonies I have found the catechism system in force. I was myself reared upon a certain Shorter Catechism, to which have been attributed remarkable virtues, and to the retention of which, when England

discarded it, the surprising development of Scotland is said to have been due. Hence I have no quarrel with the catechism system provided it is properly employed. I grieve to say the health catechisms I have seen in use have not been so employed. Remember they do not deal, like the Shorter Catechism of the Assembly of Divines at Westminster, with abstruse conundrums admirably fitted to constitute a course of mental gymnastics. That Catechism, I take it, apart from inculcating sundry religious tenets in a logical manner, provided, if carefully expounded and explained, a course of mind training which its advocates pronounce second to none. It is, however, inconceivable that the Shorter Catechism should ever be illustrated, or that, even if it were illustrated, its usefulness would be enhanced. On the other hand, what the health catechisms require is graphic exposition.

More than once I have asked a little black or brown girl to tell me what she knew about ankylostomiasis. With hands clasped behind her back and her eyes fixed apparently on the future of hygiene, she has faithfully recited her catechism and recounted all about the hookworm, from the larva penetrating the skin to the adult female laying eggs in the intestine. But when I came to ask her what an ankylostome was like she was completely at sea, and had no idea as to whether it equalled in length an earthworm or an anaconda. Rarely, very rarely, have there been diagrams or pictures to aid the childish mind. Even these, helpful though they be, are not sufficient. What is really required is the provision of models, and, when it can be managed, demonstrations from Nature itself. This latter method is not new. You may remember that it was employed by Mr. Squeers at Dotheboys Hall, in "Nicholas Nickleby." One pupil was made fully acquainted with what Mr. Squeers called the "winder" by being made to clean it, while another gained familiarity with what his master termed "bottinney" from being forced to weed the school garden.

Coming to more recent times, many of you must recall the Sanitary Demonstration Centres which were established on all the fronts during the war, and proved both stimulating and educative. Something of this kind is wanted in connection with schools in the tropics wherever a serious effort is being made to inculcate the principles of hygiene. It should neither be difficult nor expensive. In many cases the pupils themselves could make the simple models showing how latrines and incinerators should be constructed and how grease traps and soakage pits may best be fashioned. I am glad to say that the necessity for graphic exposition has been recognised in the schools at Accra on the Gold Coast.

The cinematograph should be summoned to our aid. So far I have only heard of three good sanitary films. They are the rat film, "Swat the Fly," and "Unhooking the Hookworm," the latter two, I need hardly say, being

American productions. I have seen them, and they are excellent, though both might be better adapted to tropical needs.

There is great scope for a really good film on plague. We know much about plague and can combat it upon sound lines, but it is exceedingly difficult to get native populations to co-operate with the sanitary authorities in campaigns against rats and fleas. They are either indifferent or actively hostile, but their attitude is very largely to be explained in terms of ignorance. Educate them, especially when young, and the difficulties will gradually disappear. The matter is well summed up by Mendelson in his recent account of plague at Bangkok.

He says : " The only conclusion the author can come to is that education, though an extremely slow proposition, is, after all is said and done, the only possible way of impressing the people and producing permanent results. Practice a wise conservatism, have unlimited patience and perseverance, combined with an absolute faith in the righteousness of your cause, and, in the distant future, there will dawn a ray of sanitary light, that if properly nursed may even develop into a bright star."

His astronomical simile is not, perhaps, too happily chosen, but his meaning is clear, and all with sanitary experience of the tropics will assuredly agree with him.

At the same time in certain directions immediate active work will bring about rapid results, apart altogether from the question of educating native communities, and immediate active work is required, for people are dying and there is a great load of sickness and inefficiency.

These remarks anent education have been rather in the nature of a digression, though one, I believe, amply justified by the importance of the subject.

Let us, however, now hark back to the question of research on which so much depends. I need scarcely remind you that this country was once foremost in the field. The work of Manson and of Ross, the investigations of Bruce, the findings of Leishman, the labours of the Plague Commission in India, the successful enquiries of Fraser and Stanton, the discoveries of Sir Leonard Rogers, the researches of Low and of Leiper and many other British achievements will at once occur to you. I fear, however, that at the present time we scarcely occupy the same position that we did. In some ways this is only natural. The French, a great nation where science is concerned, have long been friendly rivals ; for a time the Germans with dogged persistence wrested secrets from the tropics, and though, as a colonising power, Germany has ceased to exist, her workers are still in the field and she is turning her attention to new spheres of activity. The two nations, however, which, so far as research into the more *practical* side of tropical hygiene

is concerned, appear to be outstripping us, are Holland and the United States. They are not doing so because they have better men but because they have at their command resources which we are denied, and also because they work in some ways on better lines.

It is scarcely to be expected that, at a time like the present, our Governments can find large funds for developing research in the tropics, though it is always good policy to cast the sprat and secure the salmon, but, at least so far as the United States is concerned, a great deal of the money which has been spent of late years has come from private sources. As a nation we may be poor, thanks to the fact that, as of yore, we have saved Europe, but it would appear that there must be many individuals who possess more money than they can well spend. The wealthy American frequently endows research. As Mr. Wickliffe Rose of the Rockefeller Foundation said to me the other day, and he should know, " there is far more fun," that is the way he put it, " there is far more fun to be got out of spending money for the betterment of mankind than in any other way." If only our British plutocrats would combine to furnish the sinews of war what fun they might have and what might not be accomplished ! Apart altogether from the mere loss of life, the lack of efficiency, the labour shortage, the interference with trade, the waste and worry brought about by tropical maladies and more especially epidemics, think what they connote in the way of sorrow and misery and wretchedness !

Not long ago I saw an old Indian woman weeping bitterly because her son, her sole support in life, had perished because of plague. There are many diseases due to the ordinary wear and tear of life from which mankind may die more or less comfortably, and we may become, perhaps, somewhat resigned to such departures, for they are, to a large extent, inevitable so long as the human body is a machine. It is, however, a totally different thing when young lives and useful lives and lives which mean much to others are surrendered at the call of parasites which we know we can defeat if only means are forthcoming. We deal in a summary fashion with human parasites which prey upon society and on our hoarded wealth, but we are still somewhat callous as to the ravages of bacteria, protozoa and helminths amongst the inhabitants of our colonies and dependencies.

I think if only the wealthy in the land realised the burden of distress and inefficiency which exists and were assured that much of it could, with their assistance, be alleviated and indeed abolished, their purse strings would be loosed and the one International Health Board supported by a Rockefeller would have its counterpart on this side of the Atlantic, to the benefit of humanity and the glory of the Empire.

The comparison with Holland is perhaps scarcely fair, for the Nether-

lands is a small country blessed with large and exceedingly rich colonies, but the Dutch, a thrifty folk, have discovered that to get the best out of these colonies they must make them healthy and keep them healthy, and anyone who has studied their activities in Java and Sumatra will agree that they are working to good effect.

I have said that both Holland and the United States appear to proceed on better lines than we do. For one thing they are quicker to apply the knowledge gained than we are, a point to which I will allude immediately; for another, so far at least as the Americans are concerned, they give their research workers a fair chance.

In our possessions we establish laboratories, though even now there are not nearly enough of them, but we are apt to understaff them in a vain effort at economy and we swamp the scientist with routine work.

Instead of being able to concentrate on some promising proposition he has to examine specimens from hospitals and private sources, he has to undertake sanitary examinations of all kinds of water, food, and so forth. All this is very necessary and useful, but from a research point of view it is wasteful and unwise. There is some reason for thinking that the true research worker, like the poet, is born, not made. There should be a niche for him in every large tropical laboratory and he should be left alone to prosecute his special work. This spells money, another reason for my appeal to the plutocrats, but it also spells progress. It is along such lines that the Americans work and the results are apparent. They concentrate on a problem and when they have solved it they apply the knowledge gained. When we have acted on the first of these principles our efforts have been crowned with success. Ross, at Manson's instigation, concentrated, so far as a niggling Indian government would permit, on the mosquito-malaria problem and revolutionised our conceptions. Bruce, thanks to the aid of the Royal Society, concentrated on Malta fever and lifted the veil of mystery which enshrouded it. Again he took a microscope to Zululand and proved that Livingstone was right in his conjectures about nagana and the tse-tse fly. Finally he and others, devoting themselves to the problem of sleeping sickness, speedily shed light on dark places.

It is true that the harassed general worker has at times made great discoveries. Laveran was a busy army surgeon when he revealed the parasite of malaria; Manson, the Master, who has recently passed to his well-earned rest, was a private practitioner when his classical researches on filariasis were accomplished, but it must be remembered that the struggle becomes more intense, that there are, nowadays, greater distractions. Moreover the superman is rare.

Another point worthy of consideration is the nature of the research

work conducted. A vast deal is accomplished which has not much practical value. I am not one of those who think that science should work solely or even mainly towards utilitarian ends. Pure science, as it is sometimes called, true science, as it might well be renamed, knows no boundaries, and moreover one can never tell what bounties may result from its pursuit.

As Professor Fleming has said in his "Fifty Years of Electricity": "If we could have peeped into the laboratories of the Royal Institution in Albemarle Street, London, in the autumn days of 1831 and seen Faraday busy with his magnets, copper wire and discs and iron bars we might have wondered that so much time and intelligence were not better bestowed. But, as we have seen, these epoch-making experiments have rendered imperishable service to humanity."

Looking back, however, on the history of research in tropical medicine and hygiene there is evidence that the best results have been secured when the worker has directed his energies towards a definite goal and has had in mind some concrete advantage to be gained as the result of his labours. Moreover there is pressing need for research in certain directions which we know will prove fruitful. Apart from the fact that we wish to benefit humanity and aid the development of the Empire, it must be remembered that we are judged by what we accomplish. The lay administrator, the man of wealth, may not be impressed by the solution of some abstruse problem of high scientific value, but he is quick to note some discovery which he sees may have far-reaching results on the welfare of a country or the advance of commerce. Hence, so far as possible, it is well to be practical and to work on remunerative lines.

There is another aspect to this question of the nature of the work to be followed. It suffers from lack of inspiration and co-ordination. There are two kinds of research worker. The rarer is the brilliant man gifted with ideas of his own which he is capable of transmuting into facts, the commoner, he who, lacking in imagination, is yet, thanks to his technical skill, powers of industry, capacity for logical deduction and well-balanced judgment, able to work out some thought suggested by another, to prove an hypothesis possibly advanced by someone quite unable to establish it experimentally, to unravel the confusion of some fine but faulty conception.

We need both classes, though, of course, the first type of mind is worth much fine gold, for it is akin to genius. It is the case that men stumble on mighty truths. Chance plays a part in scientific work as elsewhere, but, as a rule, it is only by hard thinking and hard work that results of any moment are achieved. A man must be given time to think: another reason why the scientist should not be overwhelmed with drudgery.

When some new method has been evolved or new truth established how

often do we say, " Why in the world did we not think of that ourselves ? "

A recent example may be culled from hookworm investigations. Until Baermann, in Sumatra, devised in 1917 an apparatus whereby hookworm larvæ could be isolated from considerable quantities of soil no one had taken up the matter, and yet it is one of great value, for not only does it enable one to study the activities of the ankylostome in the soil, but it makes it possible to determine accurately the source of infestation with hookworm disease in any region. Baermann's pioneer work in this direction has proved of great service to the American investigators in Trinidad. Again, some of these latter, Ackert and Payne to be precise, conceived the idea of studying the rôle played by the domestic pig as a disseminator of the human ankylostome, and they have shown that this animal is an important factor in spreading broadcast human hookworm eggs.

It is curious and unfortunate that these ideas did not occur long ago to British workers, many of whom have been much more in touch with ankylostomiasis than the American observers, although it is true that quite recently O'Connor, in the Ellice Islands, and Legg and Rheuben in Queensland described ankylostomes in pigs. However this is often the case. A man brought into contact with an unfamiliar condition is more likely to emit fresh ideas regarding it than one whose perceptions have been blunted by close association with it. To this aspect of the case further reference will be made from rather a different standpoint.

It must not be thought that I wish to decry the work which is being done in British laboratories. I need only mention the careful and successful investigations of Dr. and Mrs. Connal, at Lagos, on the transmission of Loa loa by biting flies of the genus Chrysops, the manifold activities of Macfie at Accra, the fact that Archibald, in the Sudan, has traced a form of splenomegaly to bacterial infection, and that Scott, in Jamaica, elucidated the mystery of vomiting sickness, to show that we are by no means decadent. Further, have not Stanton and Fletcher, at Kuala Lumpur, worked out the pathology of what is apparently a new glanders-like malady, hitherto called Whitmore's disease or morphia-injectors' disease, but now known to have nothing to do with morphia and re-named Melioidosis ?

Our work, however, does lack co-ordination. A central clearing-house is needed, and let us hope that the Imperial Institute of Hygiene, the welcome gift of the Rockefeller Foundation to Great Britain, will function to some extent in this direction.

Where, however, we specially fail is in applying the results of our own researches and of those of other nations. Sir Ronald Ross would tell you that for years he has been as a voice crying in the wilderness, and there is no small measure of truth in this statement. Save in certain places as, for example,

the Federated Malay States, we have not tackled malaria as we should have done.

For many years we have known how to combat ankylostomiasis, but, where we have not called the International Health Board to our assistance, we have done little to grapple with the problem.

Tuberculosis is one of the commonest and most deadly diseases of the tropics. Both it and plague are largely dependent on housing conditions, but, as Prof. Simpson long ago pointed out, we muddle along without town-planning schemes and without exercising proper sanitary control as regards human habitations. Happily, however, there is a welcome change in this direction so far as British Malaya is concerned, for there the importance of town-planning is now fully appreciated, as are also its manifold difficulties.

We have long known that filariasis is a mosquito-borne disease and that it might with comparative ease be greatly diminished, if not stamped out, for its chief mosquito vectors are of the domestic type. Yet in many of our colonies elephantiasis, a truly dreadful complaint, is common.

I might easily multiply examples, but it is a depressing business, especially when one compares our efforts with what the Americans have done in the way of ridding the world of yellow fever.

I admit it is largely a question of money, but much more than money is concerned. We do not always, I fear, take these matters with sufficient seriousness; we are apt to lack enthusiasm and high ideals, we are in some ways hidebound, we pay too much respect to vested interests and the views of the politician.

Moreover, those who hold administrative posts are not always sufficiently enlightened, and there is a paucity of sanitary engineers.

The outlook is undoubtedly improving, but we are still very far from even a reasonable efficiency, save perhaps in certain favoured places.

Still there is no reason to despair. The West Coast of Africa, though not yet a health resort, is now far from being the white man's grave it used to be. Trinidad has made, and is making, remarkable progress, and a good deal has been done in British Guiana. In Iraq, as Mesopotamia is now called, and in Palestine, much has been accomplished. I noted the other day with special satisfaction that there were no less than 14 qualified sanitary inspectors on the establishment of Kenya Colony. Mauritius is setting its house in order. Venereal disease is being combated in Uganda. A public health publicity campaign has been established in India, and in Delhi a most successful Maternity and Child Welfare Exhibition was held in 1921. So, as you will see, there is a bright side to the sanitary shield, and though we move slowly, in some ways we move surely.

But we are far too slow. I think I am right in saying that the first quali-

fied British sanitary inspector to be appointed for Government work in the tropics was Mr. Murray, of Leith, who arrived in Khartoum somewhere about 1906. Yet in 1891 I find that Osbert Chadwick in his recommendations on the general sanitation of Mauritius wrote as follows :—

" The sanitary inspectors should be men of good education, not necessarily medical men. They should be acquainted with the general principles of sanitation. In the appendix [that is, to his report] will be found examination papers set by the Sanitary Associations of Great Britain and of Scotland to candidates for the diploma of Sanitary Inspector or Inspector of Nuisances. These, though not perhaps applicable in detail to the requirements of Mauritius, will give an idea as to the essential qualifications of such officers."

I turned to the appendix, and the first examination paper was headed " The Sanitary Institute, 74A, Margaret Street." Chadwick, gentlemen, was a far-sighted Sanitarian, and he would have been, I venture to think, pleased and gratified to see in the first place that the Sanitary Institute of his day had become the Royal Sanitary Institute, and in the second that it had established an examination in tropical hygiene for sanitary inspectors. Important step though this is, believe me, it is not enough. There must be in this country a course of instruction in tropical sanitation for sanitary inspectors. Home hygiene and tropical hygiene are two very different things. I grant you that the underlying principles are the same, but in many respects they have little in common, though it is true that they tend more and more to resemble each other. For one thing, the advance in tropical hygiene is bringing into force methods hitherto employed mainly in temperate climates ; for another, attention has been directed in the latter to the need of measures formerly limited to the tropics, as, for example, anti-mosquito campaigns. This makes it all the easier to train sanitary inspectors to some extent before they leave for the tropics, so that time will not be wasted when they start work, and they will be able not only to take care of themselves, but to carry out their duties in a much more intelligent manner and with due regard to their altered surroundings.

I need not enlarge on this subject, for I have spoken and written about it on many occasions, hitherto, I regret to say, in vain.

It seems to me that the establishment of the new Imperial Institute of Hygiene opens up a vista of hope and that such an institution might well lend a helping hand in the way of training sanitary inspectors destined for our colonies.

As to the utility and value of such appointments there can be no doubt. As long as the right type of men are chosen we need have no fear but that they will prove their worth. Their success is already apparent. Consider the 14 in Kenya. It is no longer a question of the thin edge of the wedge. There

are now quite a large number in the Sudan. As many as 16 are at work in our West Coast possessions, and I submit that the outlook is infinitely more hopeful on account of their presence, for they form the necessary links between the medical officers of health and their native subordinates, and they aid in that practical application of knowledge which is all-important.

And now let us ask if there is any other way in which the efforts of our executive officers can be supplemented or improved? There is, for one of the great drawbacks to sanitary work in the tropics is the isolation and the severance from centres of light and learning. A man, striving too often to make bricks without straw, feels himself lost and forgotten. "Who cares," he says, "how I do my work so long as it passes muster?" Or, again, he may find himself up against difficulties with which he is unable to cope for lack of knowledge, owing to the fact that he is far from books and journals to which he can refer. This applies not only to men in out-stations, but to the principal sanitary officers at headquarters, though things are very different nowadays from what they used to be, thanks to the admirable "Tropical Diseases Bulletin," and more especially its Sanitation Supplements. What is wanted, however, is rather sympathy and interest in the work and advice by experts given on the spot and with full knowledge of the existing conditions.

If it can only be arranged, I think it would be an excellent thing to have attached to the Imperial Institute of Hygiene a small band of advisers whose duty it would be to proceed abroad at intervals and to help those responsible for medical and sanitary work in all parts of the British tropics. I am quite sure from what I have seen and heard that such men, if of the right stamp, would receive a hearty welcome. Not only could they render signal aid to many an administrative officer, to many a clinician, to many a laboratory worker, to many a sanitary inspector toiling far from those resources which we have at hand, but they could gather a great deal of valuable information as to the conditions prevailing in, and the needs of, the places they visit.

Moreover, they would bring to bear upon the local problems that freshness of outlook to which I have already alluded and which is so valuable, and they might inspire and encourage those whose lot is cast in the less pleasant places of the earth. I can imagine no more useful type of medical missionary and no mission so far removed from the ordinary kind of inspection, which too often tends to be carping and critical. It is that personal touch which in matters general has recently been extended to the West Indies and which has been so greatly appreciated and cannot fail to be of the greatest service.

As giving you some notion of certain of the riddles to be read and of which any outlook on tropical hygiene must take cognisance, I would cite the

question of epidemics. It is much too large a question for consideration here, but it is very necessary in the future that research work on epidemiology should be encouraged. It has to a large extent been neglected in the past though there have been some notable investigations, as, for example, that of Christophers on malaria in the Punjab, which showed that the determining causes of epidemics are excessive rainfall and scarcity of food. The subject has also received attention from Buckley, Gill and Perry in India. Cardamatis in Greece correlated heavy rainfall with malarial epidemicity, but there is still need for enquiry into the determining factors. If this is true of malaria it is yet more true of plague and cholera. What caused plague to assume epidemic proportions in 1921 and, indeed, to prevail as a pandemic? We simply do not know. It may be that climatic conditions were favourable; there may have been unobserved movements of the rat population; some disturbance in trade routes or in commercial activities may have been to blame. It is useless to speculate, but it is easy to see how advantageous it would be to know the why and the wherefore and to be able to nip outbreaks in the bud.

Cholera is another case in point. We know all about its methods of transmission, or think we do, but how explain the sudden flare of a cholera epidemic of great intensity and severity, suggesting a heightening in virulence of the virus and the acquisition of unwonted powers of spread?

Again, why do epidemics come to an end? Despite the development of immunity there must always remain ample human pabulum for their causative parasites, and yet they do die out, suddenly or slowly.

Is it possible that d'Herelle has found the key to the mystery? His bacteriophage certainly exists. Does it do all, can it do all that he imagines? Are there infinitesimally small parasites which prey upon the pathogenic bacteria, which develop along with them, attack them and slay them? If so it is easy to understand how epidemics may be aborted. More research is required into this fascinating problem, into what is possibly an unexplored world of life where wonderful battles are being waged and marvellous victories won.

There is no doubt about the necessity for research, but sometimes one is dubious if we apply properly the knowledge gained.

Are we fighting plague altogether to the best advantage? We spend large sums on poisoning and trapping rats. Are these measures of real utility? I believe they are in certain directions, but I do not think we can ever hope to reduce the rat population materially, much less exterminate it, by such efforts. The rodent breeds too quickly. It obeys too literally the Scriptural injunction, "Be fruitful and multiply." It seems to me we must try and defeat it from what we may call the reproductive side. The Rodier system, as you know, is founded on such a belief, but doubts have been

thrown on its efficacy, and it is certainly difficult to apply on a large scale. For one thing it is no easy matter to handle rats, for another it is difficult to distinguish sex in the case of young specimens. This does not apply only to rats. In Mauritius these rodents became such a pest that it was decided some years ago to introduce the mongoose to cope with them. Careful arrangements were made whereby, as a start, a few male mongooses were to be liberated on the island. Alas ! someone made a mistake in his determina- of sex, and now the mongoose is as great a plague as the rats were, has almost exterminated the ground game, and has played havoc with the chicken roosts.

At the Institute with which I am connected we have tried to find out some method, some bacterial method, of rendering rats to all intents and purposes unproductive. Our idea has been that by a study of the bacterial flora of the urino-genital tract of male and female rats there might be found some organism capable of causing abortion, an organism which the male rat might transmit to the female, an organism not dangerous to man but disastrous to the rat's family life. It is true that even were such an organism discovered the rat would speedily develop an immunity against it in accordance with the mysterious laws of nature which operate against extinction. Still, it is conceivable that such a method of attack might be of great value if applied when plague threatened, when the rat population was found harbouring *B. pestis*. Unfortunately, though at times the outlook seemed promising, and though the research led to some interesting discoveries, we had to admit failure. It is, however, a line of work which might be pursued in the tropics, though I fear it is not very promising. The rat problem is, I confess, one which has so far baffled us, and the only thing to do is to build the animal out, a costly and difficult matter, but one pursued with some success in Java. One might cite other examples, but I will only mention the very big question which the layman is apt to raise.

Is there any use bolstering up feeble lives ? Are we right in striving to perpetuate the puny folk of the human race ? Is not the old law of the survival of the fittest what was intended, and are we not flying in the face of Providence in trying to upset it ? It is not altogether easy to answer such an accusation, and any endeavour to do so would lead one far afield.

Let me only say that the more we work at the problem the more we find that the hereditary transmission of disease plays a comparatively small part in diminishing our vitality. Doubtless something may still be said in favour of feeble constitutions from the time of birth, in support of the theory of diathesis. There seem to be children born with little or no resisting powers, but even here how much depends on the health of the father or the mother ? A virile stock produces virile offspring, and we, in our measures of hygiene, aim at virility.

We know beyond all doubt that what saps virility in early life is, as a rule,

bad feeding, bad housing or infection with pathogenic organisms. Study the case of the poor white children in Barbadoes and Grenada if there is any dubiety on this score.

Hence there can be no question but that we are right in our efforts to save the weakling, if only because we stamp out foci of disease in a humane manner. It is the duty of the physician to save life, it is the duty of the hygienist to preserve it. We may for a space pass through a bad period and perpetuate lives which lack vitality and bodily strength, but eventually we should reach a higher plane of efficiency and compass a better and a saner world. Again, let us remember that amongst these feeble lives there may be one or more possessing that spark of genius which means so much to mankind. A child's death is always unutterably sad, for no one can say what that child might have become. Not once in a million times would the life develop into anything out of the common, but there is just the chance that we lose a Pasteur, a Lister, some great brain, some outstanding personality, some benefactor of humanity.

Therefore we do well to attack disease, dirt, destitution and drink by all the *wise* means in our power, and of these means the greatest is education, which, at the present time, is the most crying want in the tropics : education on right lines for the teeming millions of our brown and our black subjects. An officer of the Indian Medical Service was right when he said to me : " We are willing to give up to the Indian medical man everything if we can retain our opportunities for teaching, for research, for carrying out sanitary work." The same is true of Egypt. It would be disastrous to lose our hold on these three essentials, disastrous to the very nations who are struggling for what they regard as freedom.

It would neither be fair to them nor to ourselves to remove our guidance and control in these matters until they have grasped their significance and importance. Do you recall what one of our greatest statesmen said long ago ?

Disraeli, when introducing the Public Health Act of 1875, spoke with no uncertain voice.

In a speech, famous for all time, delivered himself of these words : " A great scholar and a great wit, 300 years ago, said that, in his opinion, there was a great mistake in the Vulgate (the Latin translation of the Holy Scriptures), and that instead of saying, ' Vanity of vanity, all is vanity '—' *Vanitas vanitatum, omnia vanitas,*' the wise and witty king really said ' *Sanitas sanitatum, omnia sanitas.*' Gentlemen, it is impossible to overrate the importance of the subject. After all, the first consideration of a Minister should be the health of the people."

I would go even further and say that, so far as the tropics are concerned, it should be the first consideration of the people themselves.

Central Heating in Relation to Domestic and other Dwellings, by A. H. Barker, B.A., B.Sc.

Read at London Sessional Meeting, March 14th, 1922.

THE object of the present discussion is to throw some light on the question whether, and to what extent, the system of providing the heat requirements of buildings from a centrally placed plant can be generally adopted with advantage to the community. This question is obviously one of great complexity in view of the large number of different household requirements, the varying characteristics of the people occupying the house, the heterogeneous geographical characteristics of the localities, and the divergent costs and styles of living, which, of course vary widely in different classes.

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The idea of centralising these services to a greater or less extent, in such a way that one centrally placed plant shall provide all the requirements for a larger or smaller number of different dwellings, is without a doubt a very attractive one, especially is this the case where, as is easily conceivable, all the heat for these services can be secured from the exhaust steam or waste heat of an electric lighting plant.

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The total labour involved in attending to one apparatus is obviously considerably less than the sum total of the labour involved in attending to a large number of small ones, including the dusting and cleaning which the use of the separate apparatus involves.

It seems *a priori*, therefore, likely that the introduction of a centrally placed plant in place of the separate plants would be a great public advantage. The object of the present discussion is to consider all round the matter and weigh up all the considerations which are not obvious at first sight, especially the all important one whether the proposal is economically possible as a general solution of our problem of the distribution of heat.

The opinion I have myself reluctantly formed on this important point is that though the service would in many or most cases be a great convenience (not perhaps so great as is sometimes claimed) yet any general system of centralisation is usually impossible for economic reasons ; that the cost of the plant and maintenance required to carry it out must of necessity, in all but a very few exceptional cases, be so high that no reasonable weekly sum which could be asked from a working class family, or which such a family would pay, would provide for the cost of the service. It is the reasons for forming that opinion that I wish to discuss.

As the ground work on which the discussion may take place, it is necessary first to analyse with considerable care what are the actual requirements of houses of different classes, and to consider carefully how such requirements may be most cheaply met. It will be granted that if they can be satisfied much more cheaply in other ways, even with a reduction of convenience, the arguments in favour of a central system are gravely handicapped.

All households are not run alike. Some are extravagant, others economical. Some are systematic and clean, others are slapdash, untidy, and dirty. Some are wealthy, many more are poor. Some managers are good, others the reverse. Some persons like a very warm house, some do not. Some use much hot water for washing, others do not.

It appears probable, therefore, that the requirements of each one in respect of heat would be different. We can only strike an average on very insufficient data in order to arrive at what we want. As houses of the working class are principally concerned, we must give our principal attention to them.

It probably occurs to only few people how difficult the obtaining of precise data on this matter is. How many people have the smallest idea of the amount of heat, measured in British Thermal Units, used in their own houses, essentially for their own personal convenience, per day, per week, per month, per year, as the case may be.

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In order to obtain data of this character I am at present engaged in conducting a series of tests on some working class cottages placed at my disposal for the purpose by the L.C.C. Each of these cottages is at present arranged on the "all-gas" principle, with the double object of comparing gas with other fuels in respect of cost, and to ascertain exactly how much heat is actually used for different purposes in the course of every day, so as to find the maximum and minimum use of heat for each purpose extending over various periods of the year.

For this purpose each of these cottages is specially piped. A separate gas pipe leads to each service, gas fire, gas circulator for heating bath water, cooker, and the like, and each is separately metered. Readings are taken from these meters, and notes made of the work done every day by the person in charge. That is the only way that this information can be obtained.

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We can determine with some accuracy in the laboratory the efficiency of the various gas appliances used. I have had the appliances in the laboratory and have measured them. If, therefore, we ascertain the amount of gas consumed by each apparatus, knowing the rate of efficiency of each,

we can obtain figures of the actual nett amount of heat used in practice by the person concerned, and thus eliminate the question of waste due to bad efficiency except in so far that the gas may be wasted unnecessarily.

Knowing then the corresponding efficiency of other appliances such as electric, or those using solid fuel, we can calculate the corresponding rate of consumption of other fuels (treating electricity as a fuel for the moment, which, of course, it is not), and afterwards compare the calculated estimates with the actual figures.

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So far as I have gone, the figures confirm those which I published in my little book "Domestic Fuel Consumption," a couple of years ago, figures which were repeated from lectures I gave to the Chadwick Trust at an earlier date. According to those figures the amount of heat used per day would work out to about 80,000 B.T.U. gross per individual of the working class. In those figures are comprised the fuel used for heating, hot water supply, cooking, and lighting, lighting being also done by gas, and the figures were taken during a winter of moderate severity.

I have also ascertained the sub-division of the heat used, which is given in the following table, from which the proportion will be clearly observable. I have also figures of perhaps even greater interest showing the way in which the heat is used in the particular household under discussion.

Table of Use of Heat in Economical Working Class Cottage.

Weekly average for 13 weeks winter :—

Total B.T.U. in fuel used	512,000 B.T.U. per week.
Daily average	73,500 B.T.U.
Maximum used in one week	700,000 B.T.U.
Minimum used in one week	343,000 B.T.U.

Average for 13 Weeks.

Cooking, including hot water for tea ...	17·8%	
Workroom fires	20·2%	Total for heating
Sitting room fires	39·0%	59·2%
Washing and bathing (hot water supply)	7·2%	
Lighting	15·8%	
Total	100·0%	

The four services are commonly used in the particular case under consideration as follows :—The lady occupying this cottage is a dressmaker. The heating required is mainly for her workroom during the day and for the sitting room during the evening for herself and her guests. As she has to

pay for the gas herself, she keeps the consumption down by my instructions so that she is just reasonably comfortable, with reasonable but not excessive care that no gas is wasted. There is care, but nothing resembling privation. In the use of hot water there are about three or four small hot baths every week, and hot water is used for hand washing and scrubbing. Cooking is done for hot breakfast and dinner, and occasionally for supper. Tea is served at three meals.

Considering the heating of a living room in the winter, it is commonly unnecessary to have the room heated throughout the whole day, or to have the heat distributed all over the room in equal intensity. It is even undesirable except in cases where work is being done, as in an office. In such cases, it is obviously necessary that the rooms should be heated all over, but a small sitting room can be made comfortable to sit in near the fire by means of a relatively small fire burning an amount of gas or coal which would be inadequate to heat the room all over, but is enough if the occupants sit near the fire.

If such rooms are treated by the method of hot water radiators the temperature is almost equally distributed over the whole room, and it costs a good deal more in heat than if a small area round the fire alone is made tolerably comfortable. Besides, a radiator must be kept hot in a room for a period of many hours a day before the room is really comfortable. A fire need only be lighted for the few hours the room is occupied. One can be perfectly comfortable in front of a fire recently lighted in a room whose general temperature is from 40° to 45°F. One cannot be comfortable in a radiator heated room below a temperature of 55° or 60°.

It is only rarely that any heat is really necessary in bedrooms. For persons of ordinary physique, even those of a better class and accustomed to a reasonable degree of comfort, a bedroom fire is desirable for only a very few days of the year in our climate. In the vast majority of cases no person even thinks of having a bedroom fire, however cold it is. I do not remember that I have personally ever had a fire in my bedroom for the past 20 years. It is rarely necessary in a working class house to have a sitting room warmed throughout the whole of a day. It is only in the evening when heat is necessary.

My view of this question is, that to incur large expense, both on capital account and for upkeep, for the purposes of adding unnecessary luxuries to which people, especially working class people, are not now accustomed, seems to me to be undesirable ; and to pay for such luxuries in the present state of things is, for the majority of people, impossible.

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Now let us consider the requirements in respect of hot water. There

is, I think, a good deal of unnecessary stress laid on the advantages of what is called "a constant supply of hot water." We may grant that it is one of the items of luxury or comfort in a good class establishment, but such a supply is in my opinion a luxury which can readily be dispensed with by those who need to be as economical as possible.

It is only at particular times of the day, especially in a working class household, that hot water is required, and the quantity needed is really very small, and can be readily generated at small expense in fuel and time exactly as it is wanted. I can speak with some confidence on this, having very carefully watched the use of hot water in such a household, excluding the hot water used for making tea, as this really comes under the head of cooking.

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There is a certain amount of hot water needed for washing up the breakfast things. Any scrubbing about the house also needs a gallon or so in the morning. A few pints of hot water are also needed for washing up after lunch or dinner, whatever the mid-day meal may be called ; similarly, at irregular intervals, depending on the habits of the household, for hand washing and for bathing. The latter is the only purpose for which any considerable quantity is required. An economical hot bath requires about 7,000 B.T.U. in the water, and an extravagant one about 20,000.

The usual way in a middle-class household of supplying these requirements, and that which would be adopted in any system of central heating, is to keep a supply of hot water constantly circulating through pipes, cylinders, etc., which are commonly exposed to the cold air, so allowing heat to escape very rapidly. The heat when generated on the premises is generally by a fire in the kitchen range or otherwise, in a boiler having commonly a very low efficiency, from 8 to 15 per cent. Taken as a whole the efficiency of the entire process, that is, the ratio between the heat in the water actually used and that in the coal burnt to produce it, is commonly from 5 per cent. to 7 per cent. The result is, of course, an enormous waste. There are at least eight or ten hours in every day at which hot water, though it may occasionally be a convenience, is practically never required.

We are driven to the conclusion that, having regard to the actual requirements, the method of maintaining a constant circulation is extremely extravagant. Requirements can be provided for much more cheaply than by maintaining a constant circulation, though with a certain reduction of convenience. The use of hot water, of course, varies greatly according to the character of the housewife.

We now come to the consideration of cooking. Here again the requirements vary very greatly, and for the most part they are confined to particular

periods of the day. There is the period, ten or perhaps twenty minutes, immediately before breakfast, an hour and a half before dinner, immediately before tea, and perhaps before supper. There are also occasionally intermediate periods in certain households where bread and cakes and the like are baked, particular seasonal demands when jam is being made, and so on.

Broadly speaking, the requirements are confined to a period of a few minutes, or, in some cases, one or two hours immediately before meal times. For these purposes it is customary in most households to keep the kitchen fire burning throughout the whole day. The kitchen fire also serves to supply the hot water to keep warm the kitchen—which in a working class house is also the living room. The ranges are of such a type that the fire must be burning for a considerable period and at a vigorous intensity before the oven is hot enough to cook by.

If it were necessary to put the fire out after every use, there would be not only the trouble of re-lighting it, but also the long period of rising temperature to be waited for before any cooking could be effected. Hence it is necessary in practice that with any plant of usual design, the fire should be going all day, especially as in many cases the fire serves for heating the kitchen in the winter and overheating it in the summer. In most households the greater part of the work is carried out in this apartment.

This brief analysis covers the requirements of a working class house. It is evident from what has been said that houses vary very widely in their requirements.

Now if all such requirements are to be provided from a central system, it is obvious that we cannot limit the provision of appliances to the minimum requirements of an economical, and, it may be, a small family. We cannot tell what character of family may occupy the house in question. As a practical proposition we are, therefore, compelled to consider not the minimum but the maximum requirements ; otherwise we shall get houses occupied by families which require more than the plant will give them.

This is the first serious matter, namely, that maximum requirements have to be provided for in the design, and in such plant as is necessarily provided in connection with a central system, the cost of the appliances and also the cost of the supply of heat are, roughly speaking, proportional to the maximum capacity of the plant.

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There is here to be taken into account a psychological consideration of the greatest possible importance, namely, that if heat is provided from an external system of mains, and can be drawn upon by the mere opening

of a tap or a valve, a great deal more is likely to be used than when it is materially visible.

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The reason is that in the one case the source of the heat can be seen, and the use of power, and therefore of money, is manifest ; in the other case it is not. Indeed many intelligent persons do not now know that the amount of fuel burnt in a boiler to keep a radiator system at a uniform temperature depends on the number of radiators turned on.

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This unfavourable condition of things is greatly exaggerated when heat is obtained for a fixed weekly payment. In such a case there is no motive for the person using the heat to shut it off or to use less than the maximum amount. Indeed, such is the perversity of human nature, that perhaps the majority of persons would use as much heat as they could, solely for the half conscious purpose of getting their full money's worth.

If an ordinary working man's wife knows that her husband is paying 7s. 6d. per week for heat and hot water supply to their house, she will take care from a perverted sense of thrift not only that she gets as much heat as she can, but that she uses as much hot water as possible. I have seen this characteristic at work in hotels with which I have been connected professionally, where the cost of baths is included in the nightly charge for a room. In these cases the hotel customers will usually use twice as much water every time they have a bath as is necessary, they will have four times as many baths as they would if they had to pay for them, and will frequently leave the taps running in an extravagant manner. That is a psychological characteristic of very great importance.

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Let us now consider what must be provided for each house if we wish to give to each one the bare minimum which is necessary to enable the house to be satisfactorily run.

There are two classes of heat required in a house : one of which may be called " high grade " and the other " low grade." High grade or high temperature heat is strictly necessary for lighting, and for certain cooking purposes. It is also necessary if anything in the nature of an open fire is required where intense radiation, using that term in its scientific sense, is necessary.

For the cooking purposes alluded to, we must have command in the oven of what we will call a " temperature " of 500°, otherwise certain classes of cookery, roasting, baking and the like, cannot be satisfactorily carried out.

We must be able to toast bread and to boil water. This character of work cannot be supplied otherwise than by supplying high grade heat, such as electrical power or fuel, whether in the form of coal or gas.

Whatever else we do, therefore, we are committed as a practical proposition to a set of gas mains, if these requirements are to be supplied without solid fuel.

A very low grade heat (by which I mean heat at a temperature less than 200° F) could be supplied by means of hot water circulation from a central point. This kind of heat is only useful for heating by radiators, and may be useful for drying and similar purposes.

What may be called "medium grade" heat (that is, heat between the temperatures of 200° and 300°) could conceivably be supplied in the form of steam. Heat of this grade could be used to a considerable extent for such purposes as steaming of food, or the supply of hot water, or boiling clothes, and the like duties, which are essentially represented by the actual turning into steam of a certain quantity of water. If we have heat of this grade we must, therefore, have a steam pipe connected to a centrally placed boiler and carried to all the houses in the colony.

Such a steam pipe must be at work at least during a large part of the day, perhaps the whole day if it is to be of substantial and general service. It might conceivably be shut off during the night at the cost of severe inconvenience to individuals among the tenants, who require it urgently during the night.

Now the maintenance of a steam pipe constantly filled with steam at any pressure is a formidable proposition from the point of view of cost. However well the pipe is coated the loss of heat must necessarily be great. It cannot be otherwise, whatever precautions are taken. It must be heavily coated or lagged and the coating must be kept strictly dry, otherwise the losses may be enormous. Such a loss is only possible to be contemplated when the steam itself is a waste product, as it is in the case of an electric light station, which utilises the waste steam in this way.

Even so, steam from this source can only be delivered economically at comparatively low pressure. This, however, is enough to serve the great majority of purposes for which medium and low grade heat are required, water boiling, food steaming, and heating.

There is the further practical question of the disposal of the condensed water. There are two ways of dealing with this matter, either to discharge the condensed water to the drain with as much of its heat taken out of it as possible, or to return it to the boiler house for pumping again into the boilers.

The latter is, of course, the technically correct course, both because

condensed water as discharged always contains a certain amount of heat which should not be wasted, and also because the water itself in the large quantities involved here has value. It is, therefore, wasteful to discharge it into the drain unless it cannot be dealt with otherwise, unfortunately to return it from a long distance to the boiler house is itself very expensive. It calls for the provision of a special pipe, which often corrodes rapidly, and also, in the majority of cases where the levels are irregular, for a pump, which itself consumes power and is expensive to provide.

There is a further consideration that to provide steam from the exhaust of a turbine or other engine generating electricity reduces the efficiency of the prime mover, and thus causes a positive waste of very highest grade of heat and increases the waste of low grade heat. This would be of comparatively small importance if it were possible to utilise otherwise, in an economical and useful manner, any substantial portion of the heat rejected as a waste product by the prime mover, but the considerations outlined above show that this utilisation is attended with enormous waste, which though it is in this case a waste of what is already a waste product, is nevertheless, really waste which ought not to occur.

Such are the conditions involved in attempting to deal with this problem by means of a circulation of steam from a centre. The problem would be much more urgent and of much greater practicability if our national demand for heat in our houses were greater than it is, as, for instance, in America. In this climate it is possible to do without this form of artificial heat in a house altogether, in the American climate, it is not possible.

But even in America the position of some of the companies who have been formed for distributing heat over a large area (and, it must be remarked, passing on their way a large number of very big apartment houses closely crowded together, in which of course the revenue is greatly increased and all the unfavourable conditions are minimised) is very shaky indeed ; some of them have already gone out of business.

We have the other alternative, of course, of circulating hot water in pipes from the centre to the extreme end of the estate, and supplying the heat from these mains. This proposal involves separate flow and return pipes, which, in the case of a large estate, will be of large diameter, perhaps up to 10 or 12 in., and taking branches from these mains into the various houses, and there using the heat contained by the water, the cooled water being returned to the return main. The heat may be communicated to the water at the centre either from exhaust steam or otherwise.

This proposal is a more expensive one than the steam proposal. It involves larger and heavier pipes. In some respects it is more economical, and in some respects superior in result, but it only provides what I have

called "lowest grade" heat, that is, heat which is incapable of being used for cooking purposes, or any purpose other than low temperature warming, and if it is adopted, therefore, it must necessarily be supplemented by high grade heat from gas, oil, coal or electricity.

The provision of high grade heat is in any case a prime necessity if any house is to be completely provided. Without it any high temperature cookery, such as roasting meat, baking or grilling, sautéing, or any operation of that character would not be possible.

There is also needed a supply of very high grade heat for lighting purposes.

If we sum up all these requirements, it will be seen that it is necessary in any case to have a supply of high grade heat which involves either on the one hand electrical mains, or on the other a complete outfit of gas pipes leading from the centrally placed gasworks to each house on the estate. The alternative is, of course, the supply of solid fuel and its attendant disadvantages, or the provision of oil for lamps or for cooking.

We are thus clearly committed to at least two separate and distinct sources of supply, which may be typified for present purposes as (1) set of gas mains, (2) set of either steam or hot water mains.

It is the cost of this double supply which is such a formidable item in this calculation. All these pipes must be accommodated somehow. The only satisfactory way in which steam or hot water pipes can be accommodated is in a large subway or at least a trench. The subway is unquestionably by far superior to any other method, but its cost is absolutely tremendous. In this method the pipes are suspended in a subway, up which a man can walk so that the pipes can be kept in proper order without disturbing the surface of the roadway. It is necessary for such pipes to be periodically inspected, and occasionally repaired where leaks develop, and in other cases.

If the pipes are fixed in a trench it inevitably involves the disturbance of the surface every time the pipes are even inspected, and a considerable disturbance when they are repaired.

One practicable way of doing this is to form a more or less shallow trench cover with loose slabs resting in rebatted grooves at the side, which can be rapidly lifted when necessary. But the process of lifting a long row of these covers for the purpose of inspection is truly formidable, both from the point of view of inconvenience and of expense. The cost of such subways and trenches is relatively enormous, and it is this high cost which makes the problem so difficult.

If the pipes are hot, it is further necessary that they shall be perfectly free to expand and contract. The provision for this is always a great

difficulty and expense. It implies the formation of lateral underground chambers, in which the pipes can be diverted in large swan-neck bends so as to allow the straight lengths to expand and contract without throwing undue strain on the joints. It is at these portions of the pipe plant, that leakages are common and difficult to prevent. In any case, the expense is great. Now it is to be carefully observed that gas pipes need no such provision. They are buried in the earth ; they expand very little. Though they sometimes leak, they do not lose heat. If carefully laid they leak very little. They need no return pipe.

Taking all these difficulties together, and calculating the minimum cost of a proper provision of a central heating plant in each case, the totals work out at a very formidable figure, probably £150 per house and perhaps more, depending on the kind of house, especially when we take into account the necessity for the provision against breakdown.

The sudden breakdown of either the heating or the hot water supply would in these circumstances be so serious a matter that it could not be contemplated, and every provision should be made against such a possibility. Indeed, even with a central scheme, no house is really safe without the provision of self-contained apparatus as a standby.

The cost of these alternatives and the complication caused at the centre is very great. Thus the weekly cost to provide for the return of capital outlay alone can hardly be less than 5s. per house per week or about £13 per house per annum.

We have also the cost of upkeep to consider. As has been pointed out, the necessity for maintaining the heat or at all times to provide for the requirements of individual cases is a very serious matter. It includes not only the cost of fuel but also large charges for labour and repairs. With separate plants each one can be used as and when required without involving any other person's plant, a very great advantage. With separate plants the heat is not generated except when and where it is required.

It has been closely calculated what is the minimum rent which should be charged for these facilities, and the minimum figure in a very advantageous case may be taken as somewhere about 7s. a week, or perhaps £18 per year, which is 50 per cent. of the rent in London and a much larger proportion elsewhere. That, in my view, is a somewhat optimistic estimate. It would certainly not be economically possible to supply these facilities in any case, even of the most favourable character, for less, and my own private opinion is that it would be found in practice necessary to increase that charge considerably unless the necessity for economical use could be generally impressed on the tenants, which I fear would be impossible. This rent must be paid by the tenants all the year round, whether they are using

the heat or not, even when they are away from home, otherwise the scheme could not pay for itself.

Now I have no doubt that a household could supply its own requirements with solid fuel or gas, but especially with solid fuel, and with good economical plant for considerably less than half this sum—and I am speaking with some first-hand knowledge. The outlay is under the tenant's control, and can be stopped altogether when he goes away. I do not think with the prejudices which seem to be inborn in a British person, but on which one does not wish to lay too much stress, as it may give way after experience of the comfort of an actual system, that a working class family would take kindly to heating of the radiator type. I believe as a matter of preference the average British person would rather have his own fire and his own heating and so forth under his own control rather than be dependent on an outside source. We are an insular and independent race, and our insularity and independence for good or evil is carried into the details of our daily life.

Whether this prejudice would survive a trial of these facilities, it is impossible to say. I am, however, clear that the cost would be substantially increased, and it does not appear to me that the British working man's wife would be willing to pay the increased cost for the increased advantages, especially as she might not always regard them as advantages.

The case might perhaps be different in an upper middle class, or a professional class house or flat, where this service might, and possibly would be a great boon. But there are relatively few of such houses and they are usually spaced so far apart, and their present occupants are so poor, that the practicability of applying the idea of centralising to them appears to be very doubtful except in the case of high class flats where it is certainly practicable.

It does frankly seem to me, though I regret very much to have to form that opinion, that the only practicable form of centralising which will avoid both smoke and inordinate capital outlay, and will at the same time provide all the services that are required, and avoid the nuisance of carrying coal and ashes, and which will leave the cost under the control of the user, is a very general extension of the distribution of gas. Before gas can possibly take its proper place in the national economy, its price will have to be reduced to at least half or one-third of its present exorbitant cost. I fully believe such a reduction is impossible in present conditions, there have been many able men at work on the problem of reducing the cost of gas for many years, and they have up to the present totally failed to reduce it. It is principally for this climate and for the conditions of life in Great Britain that gas seems to me to meet most requirements, and that its adoption would be very

widespread appears to be incontestable if only it could be produced and distributed at a reasonable rate.

It appears to me that the only form in which the idea of centralising could be effectively carried out without unduly increasing the cost, would be in the case of quite a few houses placed close together, say a maximum of 12, but usually six, which would be provided with common heating boiler and common hot water supply boiler, and a set of mains, which would serve the whole of the 12. This moderate degree of centralisation need not be so expensive per house as the more ambitious and more widely spread scheme.

Further, a breakdown of one of these appliances, though it would be excessively inconvenient for the people in the 12 houses connected to the system, would not cover the whole estate. It would not be necessary to have standbys, and all the other expensive paraphernalia necessary to guard against interruption of service due to breakdown.

The houses should be selected fairly close together, say in a row, the boiler being in the middle house of the row, and the occupant of that house would take care of the stoking of the boilers. This might conceivably be done in certain suitable cases, but I can foresee even in this case possibilities of trouble.

. . . . . .

I have omitted to consider electrical power, not because I am not an admirer of that form of energy. It is by far superior to any other form of energy whatever—but because it is of such high grade, and is at present so enormously expensive as to be quite out of court, even compared with gas, which itself is out of court compared with solid fuel in most cases. I have, therefore, most reluctantly come to the conclusion that all the idealistic schemes of centralisation are to a large extent economically impossible, except when the centralising takes the form of distribution of gas, and that is economically impossible with gas at anything like its present price.

Further, we have yet to learn definitely whether the Parliamentary sanction recently given to the provision of unlimited amounts of carbon monoxide in the gas will render its use too dangerous for a low class population. I have been a member of a Committee sitting on this question. My own opinion was that the percentage of carbon monoxide should not exceed 20 per cent. by volume, as a greater proportion might be dangerous in the case of leakages.

This danger, however, depends very largely on the character of the piping. With a cheap and ineffective method of piping the danger is no doubt considerable, but with a good system of piping and care in the use, I do not know that it need be very dangerous, although it is impossible to insure that there shall be no leakages. It is necessary to bear carefully

in mind that the increase in the proportion of carbon monoxide in gas is the only way at present known whereby its price can be reduced.

There is one other possibility which has not been explored. I do not know that it has ever been proposed before, but it probably must have been, namely, that of distributing oil by means of pipes to houses. I do not see any reason why this should not become a very general method of distributing heat by centralisation. There would without doubt be many practical difficulties to overcome, but I have not the smallest doubt that it could be done. The plant required to utilise oil would, of course, be very widely different from the crude oil-burning appliances which we know at the present day: oil stoves, cookers, and lamps of modern type look as though they had come out of Noah's Ark, made by a prehistoric ship carpenter out of old tin cans. Why more attention has not been given by engineers to the adaptation of the use of oil to domestic appliances is one of the mysteries of modern life. I cannot imagine anything which would be likely to bring the price of gas down with a run than a threat of competition from oil. The pipes necessary would be one-tenth the diameter of gas pipes, and the cost of distribution probably very small indeed. The dangers might, of course, be found great and suitable apparatus would have to be invented to use oil, but if these conditions can be overcome the use of oil might have almost all the advantages of gas without the huge cost.

I fear that the subject matter of this paper will be disappointing to the many enthusiasts who regard the idea of centralisation of all such services with very great favour. I should like to assure such persons that I myself, if I conceived it technically possible, should be as enthusiastic as themselves. I can conceive of nothing more convenient or satisfactory than to be able to draw the essential requirements from a system of semi-public mains, but I have been so long in contact with the cost side of this matter that I am most reluctantly driven to the conclusion that as an economic proposition it is impossible, especially in this climate.

If the climate were much more severe than it is, there would be a greater need for these services, and it would then become practicable to ask, say a working man, to pay £16 or £18 a year for keeping his house warm, and supplying him with hot water for 12 months, but I cannot see any working man of my acquaintance, and I know a great many, being willing to pay any such sum for a service which he can provide for himself for a matter of £5 or £6.

MR. C. INGHAM HADEN (Trowbridge) said he did not share the opinion which Mr. Barker had formed with regard to the cost of the Central Supply of Heat.

The Services should be considered separately and collectively. If a tenant of a small house had to provide fuel for the supply of hot water, it would probably cost 3s. per week. He had worked out the cost for a district installation serving 220 houses, and had shown that a weekly charge of 1s. 6d. per house covered the cost. That was about the smallest number of houses which could be economically served from a central boiler house, owing to the cost of labour, which had to be spread over the total number of houses. In Manchester two schemes were being carried out, one of which was designed to serve 2,000 houses from the central boiler house. A part of the first section was in operation, and the charge made was, he believed, 1s. 6d. per week; that was the amount calculated for the complete scheme. The capital outlay, including builder's work, was met by the saving in cost by the omission of the separate boilers, etc., in each house.

Mention has been made of the quantity of water which would be used if an unlimited supply could be obtained. The experience at Manchester showed that an average of 50 gallons per house was used, which, with an average population of five persons per house, gives an average of 10 gallons per head per diem. It was suggested that spring taps should be provided for the sinks, so as to save waste of water, but ordinary taps were provided, and it was found that the tenants, instead of using bowls in the sinks for washing-up, filled the sinks with water, consequently there was the risk of waste in that respect.

It was also suggested that the account for running expenses should be made up quarterly, and a rebate allowed for users if any saving was effected, as that would tend to economical use of the water. To provide for hot water heating in the houses would entail an additional charge of about 3s. per week, but this could only be economically effected in conjunction with a combined scheme for lighting and heating.

Near Birmingham a number of houses had been fitted with independent apparatus for heating and hot water supply, where provision was made for shutting off the whole of the heating during the summer months, and the results were generally considered satisfactory by the tenants, and these had been in operation now a few years.

The author's main points were based upon experiments carried out in connection with two small houses, but he frankly admitted in some cases the idea of centralisation was not only "very attractive," but "certainly practicable."

It was not fair for a general opinion to go forth that centralisation was economically impossible when the basis deals only with workmen's cottages.

It having been stated that an economical bath required 7,000 B.T.U. in the water, the speaker pointed out that with a geyser having a 75 per cent. efficiency, with gas costing 4s. per cu. ft., the cost of the bath would be 0·9 pence. With an independently fired hot water service apparatus, using coke at 50s. per ton, the bath would cost ·32 of a penny, and even adding 100 per cent. for losses, the total cost would be ·64 of a penny.

He agreed that it was necessary to provide in every household a certain amount of high grade heat, which could be obtained either by gas or electricity, as well as the low grade heat for heating and hot water supply.

In connection with generating stations, economy could be effected, that question was discussed at length at joint meetings of the Electrical Engineers and the Heating and Ventilating Engineers, and the opinion was expressed that existing generating stations which might be disbanded under a central scheme, should be utilised as heating stations, generating electric current as a by-product.

The author stated that if the gas mains leaked they did not lose heat. As the main point in the paper was the utilisation of gas for heating purposes, the loss of gas by leakage was losing the very essence of heat.

The cost of central plant, the author thought, would probably work out at £150 per house. Mr. Haden considered that this was too high a figure, and said that in one scheme the complete hot water service system worked out at £27, exclusive of builder's work, and that the additional cost of a heating system would probably be about £50 per house.

In comparison with the suggested cost of 7s. per week, one complete scheme was described which was to include all services from one central station, namely, electric lighting, electric cooking, central heating and hot water supply, and the inclusive charge per week for all these services was to be 6s. 8d., and it was considered by the Committee of the work people who were appointed to consider the matter that this would work out to their advantage. Unfortunately, through financial difficulties, the complete scheme had to be abandoned after a small number of houses were erected. It was intended to provide meters for the electric current merely as a check upon its use, but no variation was to be made in the charge.

A case was also mentioned of a number of houses in the north which were supplied at an over-all rate with electricity for lighting purposes, and though meters were provided, it was found that the current was not used extravagantly.

The price of gas was certainly higher than it ought to be, and the author had omitted to consider electrical power as its high cost put it out of court.

Mr. Haden pointed out that it was in connection with combined plants for lighting and heating that the best results could be obtained, and that given a definite number of houses the heat load for such would be more than sufficient to give all the electric power required for lighting, not only the houses, but the roads in the neighbourhood, and believed that if Mr. Barker had carefully studied the question from this point of view he would have given a rather different opinion to that expressed in his paper.

Major A. J. Martin (London) pointed out that for at least thirty years central heating had been a practical proposition in America, but in New York they were not dealing with houses built twelve to the acre. As a matter of fact, they in this country had their own schemes of central heating in the form of gas and electricity, and he did not see how they could be improved upon. If only they could get the price of electricity and gas reduced, it would not be worth while in ordinary conditions considering schemes for the distribution of heat from central stations.

Mr. H. H. Creasey (London) said he thought that Mr. Barker's reference to Dr. Leonard Hill's opinions had an important bearing on the subject. As our bodies are constructed by Nature to accommodate themselves to sudden changes of temperature, it seemed obvious that living for a number of hours daily in a house with a constant (sometimes too high) temperature in every room was a wrong principle, and would result in a detrimental effect upon our health. He emphasised the value of radiant heat upon health, and mentioned that one proof of that was the fact that at children's hospitals, babies and young children in a collapsed condition are frequently laid in front of a glowing fire, either coal or gas, to help to bring them round or to retain life. At the hospital for sick children, Great Ormond Street, gas fires were in use in the wards.

The paper dealt with houses suitable for the working class. The gas industry considered that one coal fire should be installed for constant and heavy duty as gas was probably at the moment too expensive for the tenants to afford for this purpose, but gas fires should be installed for the rest of the rooms where the need for their use was intermittent. Such schemes were being installed in various parts of the country, and were much superior to any system of central heating, either communal or otherwise.

The author remarked on the expense of the pipe system for communal central heating schemes. A serious point in that connection was the fact that the working class women almost throughout the country have demanded gas cookers. Therefore, if gas was to go in for that purpose, why should it not be used for other purposes in the same house, as two sets of pipes are too costly, and, as Mr. Barker said, you cannot cook by hot water pipes. At Islington a central water heating installation for domestic hot water in a housing scheme had been under consideration, but the cost of putting it in proved prohibitive, as an installation of gas water heaters and gas cookers was available at a very much lower cost, and was accordingly installed.

Mr. Haden had referred to what he called the " jealousy " of a gas company because it would not run mains in one case unless they had more of the business than was offered to them. He supposed that meant the gas company would not run the mains free of charge, he would point out that gas undertakings were not philanthropic societies, but had to work on a commercial basis, and the scheme referred to would probably not have been a commercial proposition to the gas undertaking unless they had a better share of the business. They would not refuse to run the mains at all, but no doubt could not bear the cost of them under impossible commercial conditions. Gas was very requisite, and as the housing scheme could not stand the cost of two systems and two sets of pipes, something had to be dropped, and it was not gas. To his mind Mr. Haden, in defending the communal hot water scheme, had admirably illustrated Mr. Barker's point, against himself. Mr. Haden said that at one of the schemes, they had introduced safeguards to prevent the waste of hot water. That at once disclosed a weakness.

Mr. Alwyn A. Jones (London) said that frankly he was disappointed with Mr. Barker's attitude on the question of district heating; the paper said central heating, but obviously meant district heating, for he had always

thought of him as an advocate of new ideas in the heating and ventilating world. What was required was constructive, not destructive, criticism. America had, for over 40 years, possessed many very successful district heating stations, but it also had, it is true, some that were not so successful. If they looked into the latter it was found that they belonged to the early experimental stages. In America, of course, heating apparatus was more common than in this country owing to the lower temperatures of their winters, but if they could lay on hot water to houses, etc., in this country, as they did cold water, gas and electricity, it would be more generally adopted here. If the American practice was more thoroughly studied it would be found that most of our difficulties had already been solved. District heating was not unknown in this country, and Mr. Haden had already referred to the Blackley and Gorton Estates in Manchester, where the rent was only increased 1s. 6d. per week. If there was any truth in the old saying," What Manchester says to-day, the country will say to-morrow," district heating was coming. The difficulty of running the mains had been mentioned, but was the difficulty insurmountable ? He wished it was possible to obtain some authoritative figures of the cost of continuously cutting up the pavements, etc., in London, for repairs and renewals of electric cables, gas and water mains, etc., apart from the annoyance caused by those upheavals. If this cost over a number of years could be capitalised it might go a long way towards the cost of providing a duct for all service pipes. He thought the difficulty was exaggerated, for it had already been done on the north side of Holborn Viaduct, where there was a so-called underground street containing pipes and cables. The question of waste, owing to the desire to get value for money, could be easily obviated by metering like other services. The same complaint could be made about gas, and the reason gas was not more often used was that instead of using it as an intermittent means of heating the users got comfortable and failed to turn it off, and also left it burning to save the trouble of lighting again. The next gas bill either made them more economical, or they gave it up altogether. The same would apply to heating. Break-downs were exceptional, and the other services were put right without causing great inconvenience, so it would be possible in this case. In exceptional cases it would be possible in houses using electricity for lighting, to have a heater as a stand-by, and similarly in gas lighted houses, a gas heater, using either temporarily from the lighting service. The subject required more enquiry and consideration, and, perhaps, that meeting was one way of ventilating it.

Mr. J. G. Clark (London) said, with regard to the reference to Carbon Monoxide in gas the paper suggested a limit of 20 per cent. He would not discuss at the moment whether or not that figure of 20 per cent. had any special merit. The question was practically irrelevant at the present time because the average of British gas engineering practice was such that the Carbon Monoxide was well below what the paper set down as a limit, though it may be mentioned that in the States 30 per cent. is regarded as a safe limit, and is worked to without disadvantage to public health.

If this remark was read in conjunction with the Professor's allusions to gas, it would readily be seen that the great usefulness of gas, as a fuel, was in no way impaired by the presence in it of Carbon Monoxide.

PROFESSOR BARKER replying to the discussion, said, in the cottages in which his experiments were carried on, everything was at present done by gas, and each separate service was metered. He believed he would be able to supply all the requirements for 2s. per week. Mr. Haden quoted an instance where the cost was £27 for the hot-water supply and £50 for the heating, but he would like to know how much was allowed for interest and depreciation.—(Mr. Haden : Six per cent.).—They could not borrow money for six per cent., and where did the depreciation come in ? He would allow 12 per cent. for interest and depreciation, and that would not include repairs, and if they took everything into account he did not think his figure of £150 would be found far wrong. He would like to see the figures of a central-heating system which had run for five years continuously. He had not been referring to houses separately supplied with boilers and radiators, but his remarks were directed to district heating. Central heating in a house, if it were not overdone, was a great joy, but it was not good for the people who lived in the house, because he believed Nature did not intend people to be kept too warm by external means, but rather to generate and regulate their own heat inside their own bodies, for which purpose those bodies were specially designed.

The Sanitation of Places of Public Entertainment, by W. Allen Daley, M.D., B.A., B.Sc., D.P.H., Medical Officer of Health, Blackburn (member).

Read at Blackburn Sessional Meeting, March 17th, 1922.

THERE is a vague feeling at the present time that places of public entertainment are responsible in some way for the spread of infection : this is no doubt due firstly to the increasing popularity of such places, and secondly, to attention directed to them during the recent epidemic of influenza. It is well known that influenza, in common with all diseases spread by droplets of secretion from the nose and throat, is liable to be contracted in a crowded assembly ; and these places, along with trams and trains, were regarded by some with great suspicion. The influenza was, at that time, world wide, and was serious in places where neither trains, trams, nor picturedromes existed, but, nevertheless, it is desirable that we should do everything possible to make them conform to a high hygienic standard.

Further, the Actors' Union approached the Minister of Health some time ago and complained of the insanitary accommodation provided for the artists in some theatres, especially in the Provinces : they referred particularly to the want of proper lavatory accommodation, insufficient ventilation, and the dirty state of the dressing-rooms.

Again, the Education Act of 1918 gave to Local Education Authorities the responsibility of caring not only for the education of child artists, but also of supervising the conditions under which they worked, and the lodgings in which they were housed.

For many years in the large towns the plans of new places of entertainment have been shown by the Borough Surveyor to the Medical Officer of Health, and the Licensing Authority have called for his report before granting or renewing a license ; this has not, however, been done in every case. In August, 1920, a circular was sent by the Minister of Health to all sanitary authorities urging that special attention be paid to this matter.

The possible dangers to health in a crowded building are not confined to the risk of contracting infectious disease in the usually accepted sense of the term. If the building is badly ventilated a cold in the head or bronchitis may result : a headache will almost certainly follow, and the effects of an evening's relaxation will be tiredness and irritability instead of improved health and strength. One must also consider injury to health as a result of exposure to inclement weather in a queue : the danger to life if exits are insufficient and fire should break out, and, in the case of picturedromes, eye-

strain. The importance of the subject will be realised when it is pointed out that in Blackburn alone—(a town of 130,000 inhabitants)—the theatres and music halls accommodate 4,963 persons, and the picturedromes 9,720. All have at least seven shows a week : some thirteen : altogether there are 122 performances weekly. Assuming that on the average the accommodation is three-quarters full, the weekly attendance will be 104,500 : if only half-full, 69,700.

With regard to the prevention of infectious disease, it is desirable that children in arms should not be admitted, as if measles or whooping cough are contracted at an early age, a fatal termination is not unlikely. The objection will be raised that if a working class mother cannot take her baby with her she cannot go to a place of amusement at all, but I submit that though this is a hardship it is one of the penalties of maternity. Further, it is found in practice that it is most exceptional for a mother to have no-one in whose care the child can be left, and there is no difficulty, as a rule, in doing this when the mother wants to go out to work. Referring to older children, it is advisable that when the schools are closed because of an epidemic, children apparently of or below school age should be excluded from all public assemblies. In grave epidemics of influenza, such as that of October, 1918, it is a matter for serious consideration whether or not all places of entertainment should not be closed : there should at least be long intervals between the performances.

The question of queues is generally dealt with by the provision of a crush hall ; it is essential that this should be ventilated properly, or the effect on health will be worse than if they waited in the street. The Licensing Authority can always be relied upon to require sufficient exits for emergency use in case of fire.

I devote the rest of this paper to the : (a) Sanitary requirements in the auditorium ; (b) Sanitary requirements for artists ; (c) Special points in connection with picturedromes ; (d) Dancing halls.

Sanitary conveniences for each sex should be available on each floor of the auditorium. They should be efficiently ventilated, and, if possible, separated from the main building by a ventilated passage. They should be sufficient in number having regard to the congestion which may occur during the interval. Experience suggests that there should be one water closet for each sex and one urinal stall for every 450, or less, persons for whom accommodation is provided.

The most important sanitary requirement is efficient ventilation, and definite standards must be laid down. A standard of floor space usually adopted is that of the London County Council, namely, 5½ square feet per person where backs or arms are provided to the seats and 4½ where they are

not : this is exclusive of the space in corridors and at the sides. In Blackburn the floor space per person varies from 4 to 7 square feet, including corridors, and the approximate cubic space from 75 to 186 cubic feet. Dr. W. H. Davison, reporting on picturedromes in Birmingham, states that the cubic feet of air space provided per person varied from 50 to 172 : he recommends a minimum of 120.

In a building such as a theatre or picturedrome natural ventilation by open doors and windows is obviously impossible, though they should be used as far as practicable ; it is possible to admit air without light into the darkened enclosure by hopper ventilators fitted into the walls, or into the shutters which close the windows. The inlets should be large, so that the velocity of the air through them will be small. They should be some six feet above the floor and the flow of air should be directed upwards.

For satisfactory ventilation powerful extraction fans are also necessary : they must be silent and kept on throughout the performance, not put on only during the interval to clear the smoke. It is not uncommon when a visit of inspection is paid to find the fan " temporarily " out of order ; it should be so fitted as to show a subdued light when the fan is working.

I think it must be recognised now that a standard of ventilation based on the carbon dioxide content is not likely to be satisfactory, and that as the feeling of comfort or discomfort in a room depends on the cooling power of the air, any standard adopted should measure this cooling power. A satisfactory method of doing this is by Professor Leonard Hill's Kata-thermometer. The time taken for the temperature to fall from 100° F. to 95° F. is measured with a stop watch ; the shorter the time the better the ventilation. The mean of a series of 5 readings is taken and is divided into the " constant " obtained for each thermometer by experiment : the higher the quotient, which is the cooling power (in milli-calories per second per square centimetre of surface), the better are the atmospheric conditions : this reading is called the *dry* Kata-reading. The experiments are repeated with a moistened piece of muslin over the bulb of the thermometer, and the result is calculated in the same way and called the *wet* Kata-reading. Professor Hill recommends that the minimum standards for efficient ventilation should be 6 for the dry Kata and 18 for the wet. Doctors Porter and Cluver, reporting to the Municipal Council of Johannesburg, recommend standards of 5 and 16, but meteorological conditions there cannot be compared with those here. We have made experiments with the Kata-thermometer in several of the Blackburn places of entertainment and in the Assembly Hall of the Public Halls, when about 1,000 people had been there for an hour. The Public Hall reading was 6.2 dry, 19.7 wet, and the readings in the other places varied from 5.5 to 6.7 and from 16.16 to 18.95. In one, as will be

inferred from the maximum readings, the conditions were very satisfactory, in most of the others no cause for complaint could be made.

The observers recorded their impressions of the ventilation before taking the readings and observed definitely that where the dry Kata reading fell below 6 the atmospheric conditions were not comfortable. I would suggest, therefore, that a reasonable standard of ventilation for places of public entertainment would be that recommended by Professor Hill, namely, a dry Kata-thermometer reading of 6, and a wet Kata-thermometer reading of 18. In buildings where there may be difficulty now in reaching that standard, the ventilation could be improved sufficiently by the installation of another or a more powerful extraction fan and by the enlargement of the air inlets. Arrangements should be made for doors to be widely opened between the performances, and, as far as practicable, during the interval.

An enterprising firm has put on the market a volatile disinfectant which is placed in an electrically heated container ; it is claimed that it will destroy pathogenic bacteria at a distance of many feet and is non-irritating to the audience ; the latter claim is not altogether justifiable, and in a hall in which it was tried during the recent influenza epidemic a member of the audience complained that he was being "gassed." If a really non-irritating but potent gaseous disinfectant could be obtained I am sure it would be largely used. Many picturedrome managers pin their faith on the squirting into the air during the interval of a perfumed solution which is alleged to have disinfectant properties. This helps to clear smoke away and is liked by the audience ; its scientific value as an improver of the ventilation is very small.

The best disinfectant of all is sunshine, and if the rays of the sun could be allowed to enter every part of a theatre or picturedrome daily little else in the way of disinfection would be necessary. Unfortunately many of these places are built without any windows at all ; in several, at my suggestion, a large window has been placed at one side, and it has soon paid for itself by a saving in the cost of electricity used by the cleaners in the mornings.

Allied to the subject of ventilation is the maintenance of a suitable temperature and a satisfactory amount of moisture in the air. The best temperature is from 60° F. to 65° F., but a margin of a few degrees on either side is not very important ; the temperature in a picturedrome has been observed to rise 7° F. during the course of the performance without any alteration in the supply of heat from radiators. A low pressure hot water system is usually used and is generally quite efficient. To cool a building in very hot weather and to control the humidity require an elaborate plant with air ducts and fans ; if the building can be provided with cross ventilation this is generally, however, unnecessary. Relative humidity should, for

comfort, be not more than 65% or less than 35% ; in the Blackburn picture-dromes it varied from 58% to 78%, the latter being associated with a dry Kata reading of 5.5, and a wet one of 16 ; the conditions were decidedly uncomfortable.

Methods of cleaning are important. For upholstery and carpets the most satisfactory is by means of a vacuum apparatus ; wooden seats and linoleum should be scrubbed at least once a week and swept with a wet brush daily. Linoleum or composition is the best floor covering ; carpets should be limited to strips along the gangways ; if not vacuumed they should be taken out and beaten at least once a week.

Accommodation for Artists.—Even in first-class theatres the provision made behind the scenes is very different from what popular imagination pictures. In most theatres many of the dressing rooms are approached by a long flight of stone stairs ; the walls are whitewashed or colour washed ; only in the very best are both hot and cold water laid on to the dressing rooms, and the only furniture consists of a dressing table, a mirror, a form or a few kitchen chairs, and a number of coat hooks. This, however, is not a matter of health and would not have been mentioned but for popular misconception of what a " green room " is. The provision of at least one sanitary convenience with lockable door on each floor, and of hot and cold water, would seem to be essential. If children are employed, their dressing room should be as near the stage as possible.

Eye-Strain in Picturedromes.—Owing to the fact that attendance at picturedromes is so popular with children, and as their increased use for educational purposes is likely, it is necessary for us to consider fully how eye-strain can be avoided. In adults when the eye is no longer growing the danger of damage is not so great. Fortunately, a Committee of experts representing Ophthalmic Surgeons, the Cinema Industry and the Illuminating Engineering Society have been investigating this subject and have come to the conclusion that the principal cause of eye-strain is prolonged looking upwards at the pictures at too acute an angle ; another important cause is by observing the pictures from a point so far to the side that the picture is somewhat out of focus.

Subject to a reservation by the representatives of the Cinema Industry, the Committee recommend :—

> (I.) That the angle of elevation, subtended at the eye of any person seated in the front row, by the length of the vertical line dropped from the centre of the top edge of the picture to the horizontal plane passing through the observer's eye shall not exceed 35°, the height of the eye above the floor-level being assumed to be 3 ft. 6 in."

(II.) That provided Recommendation (I.) is complied with, the angle between the vertical plane containing the upper edge of the picture, and the vertical plane containing the observer's eye and the remote end of the upper edge of the picture, should not be less than 25°."

In most existing picturedromes these recommendations are not complied with, and as it means, in effect, that no-one shall sit nearer the screen than $1\frac{1}{2}$ times the height of the top of the picture above eye-level, it would, undoubtedly, involve considerable hardship on some licensees. I would recommend, therefore, that these standards apply to all newly licensed picturedromes, but that in existing buildings where the full requirement would involve serious diminution of seating capacity permission be granted to use the front seats for adults only ; all children should be accommodated in seats which comply with the recommendations of the Committee. It is recommended, too, that no unscreened source of light shall be visible to the observer.

Bad focussing, " flicker," film defects, either scratches or worn sprocket holes, movement of the picture owing to instability of the projection apparatus, and very rapid screening of the pictures are all causes of eye-strain which can be readily rectified. An average rate of projection of 1,000 feet of film in 15 minutes is most suitable for the eyes.

The question of special matinees for children may be mentioned. Provided the films are well chosen, no over-crowding allowed, and the time of the performance limited to 90 minutes, it would be better for the children than taking them to a performance designed primarily for adults. This is, of course, subject to there being no epidemic of infectious disease at the time.

Dancing Halls.—These come within the jurisdiction of the Licensing Authority if a music licence is applied for. The provision of sanitary and of cloakroom accommodation is sometimes very inadequate in these places, and the means of ventilation are either unsatisfactory or are not used.

In conclusion I summarise by suggesting that when a Licensing Authority is considering applications for licensing places of public entertainment they should take into consideration the following regulations :—

1. Children in arms should not be admitted to theatres or picture-dromes.

2. When schools are closed because of the prevalence of infectious disease, children apparently of or below school age should not be admitted to such places.

3. In times of grave epidemics of diseases such as influenza, which are spread by the assemblage of people, power should be given to the Sanitary

Authorities to regulate the intervals between performances or even to prohibit them.

4. Sanitary conveniences should be in the proportion of three for every 450 of the accommodation provided, *i.e.*, one W.C. for women and one W.C. and one urinal stall for men.

5. In all new buildings 120 cubic feet of air space should be allowed per person.

6. Windows to admit sunlight should be placed in all theatres and picturedromes.

7. Cross Ventilation should be provided whenever possible; inlet ventilators should be installed and should remain open throughout the performance; this applies to the bars, sanitary conveniences, and crush lounges, as well as to the auditorium.

8. A silent extraction fan or fans should be provided and should be put into action at regular intervals; that it is working should be demonstrated by the lighting of an electric lamp in circuit with the fan.

9. The building should be flushed with air every morning and between the performances, and, as far as possible, during the interval.

10. The standard of ventilation to be required should be :—

A dry Kata-thermometer reading of not less than 6, and a wet Kata-thermometer reading of not less than 18.

11. The temperature should be maintained between 57° F. and 68° F., and the relative humidity between 35% and 65% of saturation.

12. The whole of the upholstery should be cleaned by a vacuum cleaner at least once a week; the floor should be washed weekly and wet brushed daily.

13. Sanitary accommodation and a supply of hot and cold water should be provided for the artists on every floor containing dressing rooms; accommodation for children should be as near the stage as possible.

14. In all new picturedromes the angle of elevation should not exceed 35°, and the lateral angle 25°; in all existing premises children should be prohibited from sitting in positions where these angles are exceeded.

15. The other causes of eye-strain in picturedromes should be eliminated.

16. Proper ventilation and adequate sanitary accommodation should be required in dancing halls.

In conclusion I must express my thanks to Inspector Kenyon, of the Blackburn Health Department, who has carried out the Kata-thermometer experiments; to Mr. T. Shaw, B.Sc., who assisted him, and to the writers of the two valuable reports on this subject mentioned below :—

Report by Dr. W. H. Davison, Assistant Medical Officer of Health, Birmingham. "An Inquiry into the Ventilation of Cinematograph Theatres," March, 1919.

Report by Dr. Charles Porter, Medical Officer of Health, Johannesburg, and Dr. Eustace H. Cluver, Professor of Physiology, Johannesburg, September, 1921.

The Illuminating Engineer, June, 1920. "Interim Report of Joint Committees on 'Eyestrain in Cinemas.'"

MR. REGINALD YORKE (Blackburn) pointed out that for the past 25 years he had almost lived in theatres and cinemas, and he declared without hesitation that they were not the polluted places pessimists would have them believe. As to insanitary dressing-rooms in provincial theatres, there might be such places, but he had never seen them. They usually had large windows, which were kept tightly shut by the artistes themselves. As far as his experience went, proper lavatory accommodation was provided for each sex on each floor. Special attention was paid to the cleaning of theatre dressing-rooms, which were not drawing-rooms, and would compare very favourably with similar accommodation to be found, for example, at public baths. He agreed that plans of new places of entertainment should be passed by the medical officer as well as by the surveyor, and he had no doubt that in the future this practice would become universal. Draughts spelt ruin to a house of entertainment. Proprietors devoted considerable attention to the question of ventilation, but it was difficult to get a perfect temperature, as they did not know beforehand the size of the audience. It had always been his policy to debar children in arms from his houses, but he was not sure that to exclude children during epidemics would have the desired effect. Audiences would not sit for any length of time unless they could rest their feet on carpet. At considerable cost he was making experiments with rubber carpets. He had never heard of any case of eye-strain. The question of redundancy of cinema licences ought to be carefully watched.

ALDERMAN W. KENYON (Blackburn) said one great point in regard to places of amusement was cleanliness. He could vouch for the fact that the dressing-rooms in Blackburn were far better than some about which they had been told.

DR. F. G. HAWORTH (Darwen) said they could not prove how many cases of infection during an epidemic were due to attendance at a cinema. The difficulty with regard to cinemas was that they were not sufficiently light to secure sanitary conditions, and they ought to have windows which would let in fresh air and sunlight. When schools were closed on account of infection children should not be allowed in picture palaces.

The Chairman (Prof. Kenwood) subscribed to everything that Dr. Daley had said. If it were practicable to carry out all the suggestions he had made the result would be all to the public good. At the same time it was impossible to listen to Mr. Yorke without being impressed with the fact that here was a case where they could not apply their knowledge entirely. Mr. Yorke had referred to satisfactory ventilation as being unsolved, but he did not think it was unsolved in halls which would bear the provision of mechanical ventilation. He differed from Mr. Yorke when he said that the closing of cinemas would have no effect in the event of an epidemic.

Dr. Daley, in reply, said it was undesirable that a place of entertainment should be draughty, because they recognised that it would have no patrons, but at the same time he urged that it was possible to have efficient ventilation without draughts. In considering the statements made as to the good health of those engaged in the cinema trade it must be borne in mind that individual susceptibility varied greatly: it would be futile to argue that scarlet fever was non-infectious simply because doctors and nurses generally escaped infection. The difference between Mr. Yorke and himself was, after all, very small indeed.

Conversion of Pail Closets to Water Closets, by A. T. Gooseman, M.Inst. C.E., Borough Engineer, Blackburn.

Read at Blackburn Sessional Meeting, March 17th, 1922.

VARIOUS devices have been tried from time to time for the removal of decomposing matter. All the elements known to the ancients have been laid under tribute, fire, air, earth and water, but to-day it is generally recognised that the water carriage system is the most effective for the speedy removal of matter liable to decompose, the storage of which, even for a brief period, near our doors, may be attended with dangerous consequences.

It is interesting to note that the water carriage system was in vogue centuries ago. The ruins of Pompeii show that latrines existed which were supplied with water and from which the drains conveyed away the polluting matter.

In this country prior to 1815, it was illegal to pass fæcal matter into sewers. Such matter was usually accumulated in cesspools. It was not until the year 1847 that the first Act of Parliament was passed which made it compulsory to pass fæcal matter into sewers.

I claim that in Lancashire we have some of the most progressive Municipalities in the Kingdom, who have provided their communities with an excellent water supply, Sewage Disposal Works, Public Baths, Public Buildings, Refuse Destructors, Hospitals, etc., but many towns have still in existence thousands of those " fly factories " in the privy and pail closet.

Sanitary laws are intended to give power to communities which single individuals cannot possess, and in this country these laws, to some extent, are permissive, so that we see in some districts the Law is rigidly enforced, whilst on the other hand, community after community is still found living in the most insanitary conditions.

It is over 50 years since that sanitary abomination, known as the privy midden, was practically abolished and pails substituted in this town. The progress of those days is partly responsible for the delay in converting the existing pail system to the water carriage system. Two years ago I had a census taken of the closets in Blackburn, and the numbers were as follows :—

Pail Closets, 9,278 ; Slop Water Closets, 2,541 ; Privies, 81 ; Fresh Water Closets, 26,457—Total, 38,357.

Over 20 years ago the Blackburn Corporation under an Act of Parliament obtained borrowing powers for the conversion of pails, privies, and slop water closets into water closets. Under this Act the Corporation also obtained powers to have conversions other than privy middens and cesspools carried out, and at the same time to pay half the cost, providing the Corporation had not previously required alterations to be made in the

closet accommodation of the premises concerned. In the case of any such previous alterations, if the owner could prove that these were carried out at the Corporation's request, the expense of any further alteration would be borne by the Corporation.

Up to the commencement of last year the method adopted by the Corporation in order to have these conversions carried out, was by agreement with the property owners, the Corporation contributing a certain part of the cost. At that time it was £3 15s. for each conversion of a pail or slop water closet to the W.C. system, but nothing was allowed by the Corporation for the conversion of a privy midden.

The average number of conversions carried out per year was only 50. The Corporation were dissatisfied with this rate of progress and decided, unanimously, to prepare a Scheme for the wholesale conversion of pails to the Water Carriage system. There were certain objections at the outset, but on going into these it was found the obstacles were imaginary.

It was suggested that our water supply was not sufficient to deal with the increased number of W.C.'s, but it was found by experiment in Blackburn that one conversion will only increase the consumption of water in the town by 15 gallons per day, and, therefore, 10,000 conversions would mean only an increased consumption of 150,000 gallons per day, which, in view of the fact that our average daily consumption of water is 4,000,000 gallons, would be a mere bagatelle.

It was also contended that our sewers were not large enough to deal with the extra quantity of sewage, when the conversions were completed, but as our dry weather flow of sewage is 4,000,000 gallons per day and it is necessary to carry in our sewers at least 6 times the dry-weather flow, i.e., 24,000,000, the increase of 154,000 gallons of sewage, which the conversion scheme was found by experiment to entail, would be so small in comparison with the bulk that it could be ignored. In addition to this the practice in Blackburn during many months in the year has been to deposit the whole of the contents of the pails into the sewers at two places, and, therefore, there was less objection to its being spread over the whole of the sewers in the Borough than to concentrate it at one or two spots as has been the practice.

On the present rate of wages it would cost the Corporation £7,759 per annum to collect and dispose of the pail contents which existed 12 months ago. When the whole of the conversions are completed it will probably have cost the Corporation £60,000 in grants.

They have borrowing powers for 25 years for this work. The interest and sinking fund of this amount at the present rate of interest is £4,444 per annum, and therefore, after allowing for a few pails on the outskirts of the town which cannot be converted, and which will cost £150 per annum to collect, the Scheme will show a saving of £3,000 per annum to the rate-

payers; so there is a good margin to work on to allow for any fall in prices. Furthermore, after 25 years the interest and sinking fund on this amount will have been exhausted, and from that time onwards this scheme will entail no further expenditure from the rates, although the benefit of the financial saving and other advantages will still be enjoyed by the Ratepayers.

In addition, if the conversion of a pail closet costs the property owner, say, £6, the substitution of a W.C. for a pail surely enhances the value of the property by more than this amount, and my experience is that in the majority of cases the tenant is only too pleased to pay a few coppers a week extra in rent, which will more than repay the landlord on his outlay, in order to live under more sanitary conditions.

When the various difficulties were removed the first step the Corporation took to abolish the pail system was to meet the property owners with a view to arriving at an agreement with reference to the financial allowance which should be made in respect of conversions carried out by the owners under private contract, and after several interviews, in order to get the scheme commenced, the Corporation arranged to offer £8 to the owner who converted a pail to the W.C. system. At the same time, it was decided to engage a Staff of men under me to carry out such conversions as were not completed by the owner within one month after the notice to convert had been served, which incidentally enabled the Corporation to know the exact cost of the Conversions.

After a short time we found that £8 was considerably more than half the cost of the work, as the average total cost of the first batch converted by direct labour was only £12 . 11s. This was partly due to the decrease in cost of materials and wages and the Corporation grant was accordingly reduced to £6 . 10s., a further reduction being subsequently made to £6, and on the first of this month the grant was again reduced to £5.

In order to encourage this work being carried out as speedily as possible, and at the same time to give the private Contractor a fair chance, the Corporation contribution has been slightly more than half the average cost. Of the total conversions completed, the Corporation have only carried out 17 per cent. by direct labour, as the owners have preferred to take advantage of the grant.

The result has been that although this scheme was only actually commenced a little over 12 months ago, over 6,000 conversions have been completed, leaving only 3,000 pails now outstanding in the Borough, which we contemplate will be converted within the next few months, as over 1,000 conversions were completed during last month.

Prior to commencing work on the Scheme a map was prepared showing the privies and pails in existence in the Borough, and it was decided to serve

notices in the Districts on the outskirts of the Borough first, working gradually in towards the centre.

The effect of this method of procedure was that as the Scheme progressed, the area in which pail closets were still outstanding became more and more concentrated centrally and comparatively near the Depôt at which the contents of the pails was emptied; consequently, the number of men required to be employed on the collection of pails could be reduced, not only in proportion to the number of pail closets converted, but still further in view of the considerably reduced area to be dealt with, and it was found when half the Scheme had been completed that it was only necessary to employ 3 drivers and 9 pail men to do the work, whereas 12 months previously 9 drivers and 20 pail men were employed.

When the Corporation pay part of the cost of conversion it is subject to the work being carried out in compliance with a Standard Specification. I do not give the details of this Specification, but will mention some particulars.

Before commencing this work we specified that the height of the Cistern was to be not less than 4 ft. 6 in. from the top of the closet seat. If these regulations had been adhered to it would have meant, in the majority of cases, lifting the roof of existing closet structures, and we found, by experiments that almost as good a flush could be obtained with a reduced height of 3 ft. 6 in. above the seat. The Specification was altered accordingly, which effected an average saving of £2 per conversion, which, when taking into consideration the number of conversions, being carried out, was a considerable saving to the property owners and the Corporation.

Another important point is to see that the weight of the W.C. basin is not less than 40 lbs., and that the whole work is carried out in compliance with the regulations of the Waterworks Committee.

In the past in the event of Industrial Disputes in towns where privies and pails exist they were a grave menace to the public health, as they were left for a considerable time without being emptied pending the settlement of the dispute, and as the pails primarily existed in working class districts, it was the industrial classes themselves who ran this great danger which will now be removed.

It may be suggested that the time is not opportune from a financial standpoint to carry out this important reform, but I am hoping that I have shown you that the time was never more ripe for doing this work, as the Ratepayer, the Taxpayer, the Property Owner and the Tenant will benefit.

At the present time there is an exceptional amount of unemployment. Local authorities are carrying out schemes to find work for the unemployed which will add considerably to the rates and taxes.

The conversion scheme when completed will displace 30 men, but at a

time when work is most required it has provided most useful work for 100 men per week who would otherwise have been receiving doles, and it is better to pay wages for such useful work than doles for enforced idleness.

The most important advantage to be gained is, however, from a health point of view, as every privy and pail closet constitutes a serious menace to the health of the people, the emptying of same is a constant source of pollution to the soil, and the affected soil is trodden into the houses by the people.

That eminent Sanitary Engineer, the late Mr. Baldwin Latham, stated : " In all ages wherever civilisation has advanced to any degree of refinement, sanitary measures were invariably adopted. Alexandria, Carthage, Jerusalem and Rome each had a complete system of sewers and waterworks. When the civilisation of the Egyptians, Jews, Greeks and Romans faded the world passed through dark ages of mental and physical barbarism. For a thousand years there was not a man or woman in Europe that ever took a bath. No wonder there came the wondrous epidemics of the middle ages to cut off one quarter of the population of Europe. But even when the middle ages had passed away and the Sun of Civilisation was again rising over the gloomy darkness of these centuries what a heritage of filth-produced diseases still remained."

Money considerations are often of greater importance than the questions of life and health, thus literally fulfilling those lines written by the poet, Burns :—

" Man's inhumanity to man
" Makes countless thousands mourn."

Mr. R. Wolstenholme (Blackburn) contended that if the Sanitary Authorities compelled a property owner to convert his property from the Pail to the Water Carriage system on the ground that the conversion was for the public health and benefit, then the public ought to pay for such conversion out of the rates, and the owner ought not to have to place the cost of such conversion on his tenant in the shape of extra rent, seeing that the general community would participate in the resulting prolongation of life and better health.

Councillor E. Porter (Blackburn) inquired whether it was not a fact that landlords were putting up the rents, and that the increases would remain for ever. He observed that by the extra rent the landlord would recover his cost in ten or fifteen years, and would then go on receiving the increased rent. He was pleased the local authority were making the conversions.

Councillor T. Sharples (Blackburn) agreed with the contention that the community should pay for the conversions when they were for the benefit of the community.

Councillor A. Townsend (Blackburn) said the Corporation had behaved generously to property owners in the way of grants in connection with conversions. It was not a sound argument that because the local authority desired public improvements the cost should be borne by the rates.

Economy in Sanitary Appliances and Methods of Drainage, by Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A. (vice-president).

Read at London Sessional Meeting, April 11th, 1922.

WHEN I was asked to undertake to open a discussion on "Economy in Sanitary Appliances and Methods of Drainage," I did so without considering what was really involved, especially when those before me probably for the most part have a more intimate knowledge of present practice. Also when the local bye-laws are no more adhered to by the authorities themselves under the pressure of the Housing Department of the Ministry of Health, which has, if I may say so, cut down the requirements to the bare bones.

The question therefore arises, are the bye-laws, model and otherwise, to be brought down to the new level?

Economy should not be judged entirely by present saving in money. Some economies lead to higher maintenance expenses, and these should be avoided if possible; but assuming that a public body has to bear the cost, then economy should be considered in connection with efficiency and low maintenance expenses.

The model bye-laws issued by the Ministry of Health, upon which most of the local bye-laws are based, contemplate separate connections with sewers from each house; but this has been departed from, and as many as 12 or 14 houses are drained together, and have but one connection. This would lead to difficulties, but so long as the houses remain the property of one body no harm arises. The economy, therefore, results in the saving of 12 or 14 manholes less one, with certain lengths of drains, and in money from £10 to £12 per house.

When the separate system of sewering is adopted the cost per house is increased owing to the duplication of the parts, such as branches, traps and vent pipes, and the average increase of cost may be put at £10 per house. On the other hand, the rates are saved the cost of dealing with excess of water and rainfall, which can be turned into a stream or ditch which may be adjacent.

Needless to say that drains should be laid in direct straight lines, and to the shortest routes; but manholes are required at each change of direction in soil drains, and attention should therefore be directed to the possibility of omitting this expensive item. Of course, this is more easily done when there are few breaks in the frontage lines, either at the front or the back. For instance, in one case there might be 4 manholes to 10 houses; in another case, 2 manholes to 8; in another, 3 manholes to 10; while

in yet another there are 6 manholes to 18. It will therefore be seen that economies can be effected by a careful consideration of the layout.

Rodding eyes should be brought up to the surface at the end of each line of pipes, and in a separate system the number is doubled.

The number of gullies depends, to some extent, on the internal arrangement of the house, but efforts should be made to bring together waste and rainwater pipes, not only to save the cost of gullies, but of the connections between the gullies and the drains. The bye-laws provide that sink and bath wastes should discharge into a channel discharging over a trapped gulley. This channel, while costing money, is objectionable, as the waste water leaves a deposit on the exposed surfaces, and adds to the items requiring cleaning.

The requirements of the Housing Department's specification can hardly be improved upon in the way of cutting down, but it is unnecessary, in my view, to use British Standard tested pipes, and the joints are better without gaskin ; and I should prefer that the Portland cement for jointing should be mixed with three parts of sand. This, well trowelled, would make a perfectly watertight joint, and would be less liable to air cracks than cement, either pure or mixed with an equal part of sand.

Curbs are not required around gullies when paving is provided, but only when the soil or path is loose, and liable to be washed into them.

The manholes described are of the minimum size, but being, as a rule, shallow, they afford sufficient space for access ; but the covers which have been supplied under the D.B.M.S. are on the side of lightness, which is not economy.

The ventilating pipes, to be in accordance with the bye-laws, should be of the diameter of the drain, and not less than 4 in. With a number of houses on one system there may be 6 in. drains, but it would be absurd to provide a 6 in. ventilating pipe, and in an ordinary system a 3 in. pipe should suffice, and a 4 in. for any reasonable number of houses on a system.

In housing schemes dealing with considerable numbers, it is by no means certain that a trap is needful in the connecting drain, and its omission would certainly avoid the possibility of a stoppage, and a rodding eye would meet the requirements of the case.

I will now deal with the interior of the house. The most important economy that might be effected here would be to provide for the w.c., bath and lavatory, if there be one, on the ground floor. By this means soil pipes, lengths of waste and vent pipes, could be avoided, and the arrangements, including services, very much simplified. The w.c. could be approached by a lobby at the back or side entrances.

It is not easy to estimate what the saving would amount to, and it would somewhat depend upon the arrangement, but it would be considerable.

The bye-laws require soil pipes and the vents from same to be 4 in. in diameter. This, of course, is excessive for one w.c., or even for several; but in the case of cottages 3 in. should be enough, the length being only about 3 yards, while the vent would be continued of the same diameter. If the w.c. were on the ground floor the trap would be connected direct with the drain 4 in. in diameter.

The bye-laws require every w.c. to have one outside wall and a window not less than 2 ft. $\times$ 1 ft. This is, I consider, too small, and it should be at least double this size in area. The bye-laws also provide for an air brick for constant ventilation. This might be omitted.

There are numerous patterns of w.c.'s, but economically priced ones of cane-glazed stoneware can be obtained of quite as good shape from practical considerations as the more expensive ones, and when cost is important an ordinary cane and white pan and trap meet the case. The wood rim or seat should be hinged.

The water waste preventers can be obtained in large variety, but a pull and let go arrangement is the best. The cistern should fill quickly, and there should be the minimum of working parts. The patterns called "Japkap" and "Harriap" are apparently the most desirable of those on the market at the present time, and are noiseless, which is particularly of importance in small buildings having thin partitions, such as cottages. For economy the down pipe can be of steel, with a slip joint. A putty and canvas joint to the arm of the pan is best, and as economical, if not more so, than other forms.

There is nothing to suggest in the way of economy as regards baths and lavatories, except in the price of the articles themselves, and as these have fluctuated considerably during recent times it is of little use discussing prices till the time arrives for purchasing.

The D.B.M.S. patterns are about the cheapest forms that can be obtained, and the green glaze the most reliable.

The sanitary arrangements of buildings in towns have to be considered from a somewhat different point of view. The buildings are often crowded together, and the drainage bye-laws of the L.C.C. cannot very well be departed from, but there is considerable waste on occasion. For instance, in business premises the whole of the sanitary cooking arrangements, etc., may be on the top floor, and rainwater, soil and waste pipes have to be carried down and ventilated separately. It seems to me that the same arrangement might well be adopted at the upper level as would be used if the system were slung to the sub-basement ceilings, and so save the cost of two pipes out

of three, as well as the difficulty entailed in finding suitable courses for such purpose, particularly in the case of steel-frame buildings.

Under these regulations inside soil pipes have to be of lead with wiped joints, while waste pipes may be of iron or stoneware. It seems to me that iron might be equally well allowed if desired. From a practical point of view lead has the advantage of facility in surmounting difficulties of route, but selection might well be left to the building owner, having regard to tests required to be put upon the system.

Where there are a number of w.c.'s it is often impossible to place them all against an outside wall with a separate window, but so long as they are enclosed with partitions about 7 ft. high, well below the ceiling and in a well-ventilated space there is no harm in waiving these requirements, as is often done.

It would, however, be false economy to use light or badly constructed cocks and other brass fittings.

The relaxation in bye-laws authorised under the Housing and Town Planning Act of 1919 ceases to operate on the 31st July. It would be interesting to know what action will be taken, if any, in regard to relaxation after that date.

With regard to water supplies, the Metropolitan Water Board do not seem to consider economy in any way, and I venture to think that some expense might be avoided.

The service pipes are all to be of certain prescribed weights, whether they are under the pressure of the Board's mains or merely that of a few feet from the cisterns. It is obvious that a considerably lighter weight could suffice under the latter condition, and some mean should be allowed between the weights given for service pipes and those pipes having open ends, say $4\frac{1}{2}$ lbs. for $\frac{1}{2}$ in., 7 lbs. for $\frac{3}{4}$ in., and so on.

Lead, copper or iron pipes are permitted according to the Regulations, except where, in contact with the ground, but pressure is used to cause the lead service to be taken to the tanks. At the present time there would be considerable economy in using iron from near the ground line.

Then, again, the Board require all cocks and W.W.P.'s to be tested by it and stamped. This is not done for nothing, and involves cartage and certain small fees which add to the cost per house. Separate warning overflow pipes are required to each lavatory basin. This is costly if there is a range.

The officers of the Board appear to be very conservative and hard to move to sanction new patterns. Something needs to be done to facilitate these matters.

If the W.W.P.'s are of wood, lead lined, the lining has to be of the same

weight as for ordinary storage cisterns; 3 lbs. is sufficient for the small size of a W.W.P.

The Housing Board specify storage tanks of 40 gallons, but in one case that I am aware of 120 gallons was required; and it was only after much negotiation and loss of time that the matter was adjusted between the two Boards, and 60 gallons was decided upon and the system converted into a constant one.

The standard demanded for cocks should be definite, so that there may be no difficulty in makers understanding what would be the minimum and the type which would be accepted, and some arrangements made by which all these articles might be approved and stamped before being put on sale.

Mr. Edward Willis (Chiswick) thought it was a mistake to exercise too much economy on any matters of drainage or plumbing, which were, as far as possible, kept out of sight, since, until illness resulted, defects often remained undiscovered.

He was in agreement with the principle of adopting combined drainage for several houses or blocks when properly and scientifically designed, but he would emphasise the absolute uselessness of the channel for rainwater pipes. It was much better for such pipes to discharge, in his opinion, directly over gullies, and a similar procedure was equally desirable for bath or sink wastes when trapped, or all could be taken to a central gully or grease trap.

He very much deprecated the omission of safes under w.c.'s, baths and cisterns, since the initial cost of the safe was often money much more economically spent than repairing ceilings due to leakage.

The Housing Department had undoubtedly made some improvements, one of which was the projecting rainwater and soil pipe, but he regretted they had allowed the quality of materials for drainage purposes to be reduced to a lower standard.

He agreed with Sir Henry in the absurdity of requiring abnormal thickness for service pipes where the pressure would be always low, in consequence of the same being determined by the height of the building in which used.

Mr. J. Osborne Smith (London) said he was glad some weak and wasteful sanitary bye-laws had been referred to. While retaining the spirit, high aims and sound principles which have come down to us through the bye-laws, we must improve the methods and details in the direction experience points out and economy dictates. For example: Hard and fast rules must not be applied to dissimilar conditions. By careful planning traps and gullies, soil and waste pipes, drain chambers, length of drains, etc., can be reduced to a reasonable minimum.

Concrete was not *universally* required to ensure a sound bed for stoneware drains, and rarely for iron drains.

Large costly covers to chambers on drains are unnecessary ; small but strong covers, sufficient for ordinary access, cost much less.

Sweeping arms and other effective alternatives to chambers can be formed in suitable positions at less cost.

In many positions metal trays are not required under the new Universal pedestal closet apparatus and modern baths.

Precautions to prevent syphonage are usually much more costly than they need be

PROF. E. R. MATTHEWS (H.M. Office of Works) differed from Sir Henry Tanner regarding the omission of tarred gaskin in the jointing of sanitary pipes, and considered that this material should be used. As to the cement jointing, it had been his custom to use a 2 to 1 mixture (2 of sand and 1 of cement). When using " neat " cement he had frequently noticed that the expansion and contraction of this material had caused slight cracks in the collars to occur.

He advocated the introduction of disconnecting traps, but considered that much saving would be effected if, instead of building a disconnecting chamber, a trap was put in with a vertical pipe leading to the surface. He illustrated this by a sketch.

In certain housing schemes it had been his custom to insert one trap for every 10, and in exceptional cases every 20 houses, and he found that this was satisfactory, and a great deal of saving in the cost was effected by it.

As to the testing of drains by water, he had tested (by water) pipes that had been laid in a trench, and found no leakage whatever, but after filling in the trench he had observed that the pipes would not stand the water test, although the head was the same. It was more necessary to test the pipes after the ground had been filled in than it was to test them in the open trench, although the latter practice was usually adopted. It was useful to test them in both ways.

With regard to air pipes he was afraid that many people did not understand their precise function. Quite recently he inspected a public building seven stories high, with ranges of w.c.'s on each floor and a large kitchen on the top floor, but he found that the air pipe was only 3 ins. in diameter, the consequence being that on the sub-ground floor syphonage was continually taking place, and this was only remedied after an additional 4 in. air pipe had been installed. Architects were usually in the habit of putting in air pipes which were much too small.

With regard to the separate system of sewers, experience had taught him that a duplicate system of sewers was generally advisable, but he had found that very often a separate system had been put in when there was no need for it as the soil sewers had not sufficient to do.

The open channel for the waste pipes to discharge on to, he thought very objectionable.

In many housing schemes a 6 in. drain had been laid when a 4 in. one would have been sufficient.

MR A. P. I. COTTERELL (London) said that having during recent years seen much of the sanitary economy of other countries, he deprecated an economy in sanitary appliances and methods of drainage because they were

so vital to the amenities of the dwelling. There was a great temptation to save in this way but to spend in others where the result of the expenditure is more pleasing to the eye, and it would be better to save on house decoration rather than on house drainage.

At the same time there were doubtless many appliances and methods that could be simplified without sacrificing efficiency. In this connection there was the intercepting trap, an item involving considerable expense, and one of the weakest points of the system. A Government Committee had already reported that where the sewerage system was in good order this trap might well be omitted, and there were many towns where the advice could be followed.

He drew attention to a form of jointing of pipes shown at the Sanitary Congress at Belfast, the Tubous Joint. It consists of a canvas sausage or sack filled with semi-liquid cement that is tucked and caulked into the joint, the remainder being made good with cement and sand in the usual way. He had used many miles of it, and found it both efficient and cheap.

Mr. Fred Osborne Smith (London) said that considerable economy coupled with greater efficiency could be secured by simplifying the present complicated system of plumbing in soil pipes, waste pipes, anti-syphonage pipes, etc. He had had the advantage of having under constant observation for several years such simplified plumbing in actual use in public buildings, military hospitals, and private dwellings, and although he was prejudiced against it at the beginning and was always on the look out for defects, he was easily able to eliminate such as were found, with the result that the scheme was most successful and greatly appreciated. Without going into the numerous details, he mentioned the use of the cast iron soil pipe inside the building (the pipe being of rather heavier design than the present L.C.C. soil pipe, for bath, sink and lavatory waste, as well as the w.c., saving additional and unnecessary pipes and gullies.

He had designed the drainage and sanitary arrangements of a large office building in which he had a range of six w.c.'s on each of ten floors entirely without anti-syphonage pipes, and all pipes were 4 ins. diameter. The arrangement was a 4 in. vertical soil pipe from drain to above roof, a 4 in. horizontal branch at each floor level to receive the contents of the individual closets, and a 4 in. vertical pipe from basement to above roof connected to the upper ends of the horizontal branches. The closets were syphonic, and the water for each flush was 4 gallons. The waste pipes from the basins were arranged similarly, but with 3 in. diameter galvanised screwed iron pipes. The rainwater pipes discharged into gullies.

There were syphonic closets on the market which were cheaper than the wash-down pattern and less noisy in action, but were prohibited by the local authorities, and the water companies do not approve the flushing cistern. He had had the type of closet and cistern under observation and daily use for many years without being able to detect a single sanitary defect, although wishing to be able to do so. The slight defect with the flushing cistern was such as was found with all water valves, the seating sometimes becomes defective, allowing waste of water. That, however, was a common defect with bib taps over sinks, baths and lavatory basins.

It was time the 20-year old bye-laws were brought up to date. Our knowledge, experience and execution have improved since they were created, and those who have travelled and had the opportunity of studying other systems and of designing and executing schemes which combine the good points of these other systems are only too conscious of the shortcomings of our own system for the sanitation of buildings.

Ignorance and prejudice are always opposed to progress, and experience in demonstration must overcome this opposition.

Local authorities were largely responsible for excessive cost and lack of efficiency in domestic sanitation.

Gulleys with open channels leading from sink and bath waste pipe was a case in point, and was a most filthy and insanitary arrangement condemned 20 years ago, but still often requested by the powers that be.

Gaskin in cement joints was worse than useless, and should never be used. The cement which may escape at the inside of the joint should be carefully cleaned out as the work proceeds. The use of gaskin makes foul drains and weak joints. Neat cement, in his experience, made the best joints, but it must be of the right temperature.

Iron covers to drain chambers were generally too large. He remarked that, as he had to go into the chambers he designed, he arranged that he could get in with the least amount of inconvenience. That was accomplished by using a cover with an opening 24 ins. by 13 ins. placed in such a position that the step irons did not obstruct the way, and that the shoulders could pass through without twisting the body into almost impossible attitudes.

Mr. Albert Duck (Woolwich) was doubtful as to the value of Portland cement in connection with the jointing of drainage work. The use of Portland cement had developed into a kind of fetish. This might be excused if results justified it, but one finds that after drains have been laid but a short time, it is extremely doubtful whether they will pass a water test, and in many instances they are decidedly defective. The elaborate encasing of drains in concrete does not add in any way to their effectiveness, but renders them more inaccessible for either investigation, repair or alteration. A solvent for Portland cement would be a valuable material, something that would readily disintegrate it. He had made enquiries from scientific men as to the possibility of its discovery, but had not received very hopeful reports. There was sometimes an extravagant duplication of manholes and not enough use made of junctions, and there was one other thing that appealed to him, the elaboration of pipe work, anti-syphonage pipes, etc., one often sees. The question arose as to whether all the elaboration and intersection of pipes was really necessary. He had a doubt in the matter.

Mr. C. Austin (Holborn) failed to see how combined drains would save manholes, as there should be one at the junction of each house drain with the common drain. What was saved was the intercepting trap and cost of connection to the sewer, which, in the case of a wide road and deep sewer, was considerable. How could a w.c. on the ground floor save the cost of a soil pipe if each house had a ventilation pipe at the head of the drain which could also be a soil pipe without further expense ?

The L.C.C. Bye-laws required amendment in the interests of economy as well as common-sense Certain notable defects, viz., lack of definition, to wit, what was a w.c. ? Was a urinal a w.c. ? Was a range of closets with low partitions in one room a w.c. or was each separate compartment one ? If so, the Bye-laws required a window to each, thereby compelling the whole series to back against an outer wall, whereas a large window at the end would economically ventilate them all.

The bye-law as to windows barred skylights. In the centre of London it was often virtually impossible in making alterations to buildings which covered the whole of their sites and were hemmed in by other similar structures, to find room for w.c.'s against outer walls ; there were no outer walls excepting in such positions that, on account of the value of the floor space for offices, showrooms, etc., in the interests of economy w.c.'s must be built with skylights, and there was no reason why they should not be quite sanitary.

A speaker remarked why should so many inspection chambers be required (at junctions and changes of direction). While discussing the use of Portland cement he informed the meeting that on an occasion of a drain being choked it took two men so many hours to open up a drain at a junction. He answered his own question !

The object of ventilation in many instances was to prevent "air-locking."

There were many arguments against the use of intercepting traps. They were the first points to get choked. With good house drains the absence of such a trap was all for the benefit of the sewer, which would be ventilated through the house drains. So much meaningless horror of "sewer-gas" existed. There was really no such thing in the case of ordinary sewage in ventilated sewers ; the air in the house drain itself was more offensive.

Mr. R. C. Jull (Tunbridge Wells) agreed that in making cement joints to drains, neat cement or even cement and sand in equal proportions was not necessary, and advocated 1 part of cement to 3 or even more of sand, with the addition of one of the modern waterproofing compounds. The chief drawback to all cement joints, however, was that the drain so constructed was perfectly rigid, and the slightest movement of the soil caused fracture. A joint formed of some material that would give a little with the movement of a clay soil was what was really needed.

THE ROYAL SANITARY INSTITUTE.

FOUNDED 1876.

REVIEWS OF BOOKS.

MODERN SANITARY ENGINEERING.*

PART 2.—"SEWERAGE."

This section of the work entitled "Modern Sanitary Engineering," is probably one of the best text books on sewerage, as it embodies sufficient theory with practice gained by the experience and scientific knowledge of the author.

The book not only is a real storehouse of information for the student, but the skilled engineer can equally find useful notes on general practice.

There are, however, some minor criticisms of a constructive character which might be well considered when subsequent editions are being published, in order to add to the usefulness of the work.

Chapter 1, dealing with "The General Principles of Sewerage Design," might usefully include the legal position of Local Authorities in relation to the work outside as well as inside their districts. The clauses in the Public Health Acts dealing with same might be reproduced.

In Chapter 2, dealing with the "Evolution of a Scheme," the Support of Sewers Act, and how it affects sewerage in mining areas, would also be an acquisition.

Chapter 3, entitled "The Size of Sewers and Quantity of Sewage," mentions the experience of the late Mr. de Courcy Meade at Manchester, in connection with storm water, and it would appear that some mention of British rainfall could be usefully added, as an analysis of such figures in any district should be helpful in designing storm water sewers pending other detailed information.

The velocity of flow in sewers is dealt with in Chapter 4, and the hydraulic mean depth or hydraulic radius, which is often a pit-fall for students, is well explained, together with some useful charts.

In Chapter 5 the subject of sewer flushing is well discussed, and some practical absurdities pointed out. Automatic flushing tanks are recommended, but the disadvantages of same, or the necessary attention required, does not appear to have been emphasized.

In the next chapter, detailed information on sewer excavations is available, whilst trenching, transporting and tamping machines are mentioned, but these paragraphs could be amplified, as English makers are now approaching this question.

The construction of pipe and brick sewers occupies the next two chapters, and calls for no special comment. These are followed by a useful chapter on sea outfall sewers.

* MODERN SANITARY ENGINEERING, Part II., SEWERAGE, by Gilbert Thomson, M.A., F.R.S.E., M.INST.C.E. 8vo., 205 pp., Illustrated. London, 1921. Constable & Co., Ltd. Price 18s.

The vexed question of sewer ventilation is dealt with in Chapter 10, manholes and lamp holes in Chapter 11, and street gullies in Chapter 12, all of which give useful practical information, but on page 137 it is a pity circular corners have not been indicated on the diagram as being more suited to modern conditions than those shown, when the gullies would have been taken somewhat further back and interfered less with the wood paved or granite pitched crossings over the carriageway. The diagrams of gullies could also have been usefully amplified.

Chapter 13 deals with inverted syphons, about which a good deal of misapprehension exists.

The author admits in Chapter 14 that the mechanical raising of sewage is outside the compass of this small volume, but he gives some useful notes on mechanical efficiency, source of power, uses of compressed air and electricity, Humphrey and other pumps, Shones ejector, and Adam's sewage lift, all of which notes can be read with interest.

Chapters on "Storm Overflows," "Connections to House Drains," "Specifications and Schedules," and the "Drainage and Sewerage of Housing Schemes," complete a volume full of interesting information and in readable form. E.W.

Crowley's Hygiene of School Life.*

Without limit is the domain of public health. Some twenty years ago the student aspiring to that rare qualification, a diploma in sanitary science, had about six text books in hygiene from which to make a choice. Any one of these books contained sufficient information for examination purposes. To-day the monograph seeks a place in the sun—and rarely finds it. In the making of books there is no end. School hygiene is, perhaps, the least of the offenders.

In Crowley's Hygiene of School Life, there is, at least, no aggravation of the offence. It is not a new book or even one that is re-written. It is true that there is a fresh chapter on juvenile employment, and an additional dedication ; the latter might be mistaken for something quite different.

Dr. Crowley wrote a clear comprehensive and readable book, but the fourth edition ought to have been brought more fully up-to-date. J.C.

Elements of Hygiene and Public Health.†

In the preface to the first edition of this book the author admitted that the subject-matter had been largely borrowed from the works of other writers. Having regard, however, to the fact that that edition was exhausted in less than two years after publication, it would appear that he had produced a book exactly of the type desired by the students in India, for whom it was intended. The second edition is somewhat larger than the first and contains several new chapters, and, like the first, it will, no doubt, be greatly appreciated by those for whom it is intended. It may even, as the author hopes, be adopted as a text-book in the medical colleges of India. C.P.

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* Crowley's Hygiene of School Life, by C. W. Hutt, M.A., M.D., D.P.H. Fourth Edition revised. 8vo., 450 pp. London. Methuen & Co., Ltd. Price 6s.

† Elements of Hygiene and Public Health, by J. P. Modi, L.R.C.P. & S. 8vo., 497 pp. Calcutta and London, 1920. Butterworth & Co. Price 10s.

PUBLIC HEALTH, MEDICAL JURISPRUDENCE AND TOXICOLOGY.*

These two books represent the fourth edition of Dr. Aitchison Robertson's, Manual of Medical Jurisprudence, Toxicology and Public Health, that last appeared in single volume form in 1916. In the preface to each the author claims that the contents have been "thoroughly revised and brought up-to-date." In the volume relating to Public Health particularly, complete success does not appear to have attended his efforts in these directions, and the student who prepares for his examination exclusively upon this manual may find himself making statements likely to startle his examiners, if they happen to be persons practically concerned in public health administration.

C. P.

PULMONARY TUBERCULOSIS, ITS ETIOLOGY AND TREATMENT.†

The author opens with a well-written and comprehensive historical and ethnological survey of the disease from the earliest times—as far back, at any rate, as 2,000 to 3,000 B.C.

He then proceeds to consider the essential etiology of the disease, and, affirming that tuberculosis is "either . . . . caused from beginning to end by the tubercle bacillus or is pre-eminently a constitutional disease," decides emphatically in favour of the latter alternative.

Dr. Muthu, and other members of the same school of thought on this subject, focus their attention on certain phenomena connected with the etiology of tuberculosis, to the exclusion of others equally convincing and obvious to persons of different views from theirs, but which do not fit in with their scheme of causation.

Most of us are still content to believe that infection from without by Koch's bacillus is the deciding factor in the disease, but Dr. Muthu seems to favour Béchamp's view that tuberculosis in animals is the expression of poor soil and poor nutrition, and not of infection from without, for he says that the facts already before us "give us the right to surmise":—(1) "That micro-organisms arise for the most part from within from the altered condition of the blood." (2) "That this altered state of the blood has been brought about by a vicious environment . . . . causing the saprophytes to take on pathogenic properties which make for diseased processes." (3) "That, in turn, these pathogenic organisms, by a more favourable environment, can become saprophytes and harmless, which coincides with the return to health."

Dr. Muthu is extremely well posted in the literature and statistics of his subject, and his references to authors and authorities are unusually full and accurate. The completeness of his bibliography, too, adds materially to the value of his work.

Some excellent hints are given with regard to diagnosis, especially in the earlier stages of the disease, but the author has to confess, like other workers

*MANUAL OF PUBLIC HEALTH AND MANUAL OF MEDICAL JURISPRUDENCE, by W. G. Aitchison Robertson, M.D., D.Sc., F.R.C.P.E., F.R.S.E. 8vo., 260 and 414 pp. London, 1921. A. & C. Black, Ltd. Price 8s. 6d. and 10s. 6d.

† PULMONARY TUBERCULOSIS: ITS ETIOLOGY AND TREATMENT, by David C. Muthu, M.D., M.R.C.S., L.R.C.P. 8vo., 381 pp., illustrated. London, 1922. Ballière, Tindall & Cox. Price 12s. 6d.

in the same field, that "what one sees in clinical practice is an apparent irregularity, inconstancy, and confusion in the various periods and stages, and in signs and symptoms."

With regard to treatment, he has much to say that is wise and helpful, especially concerning the best methods of applying the *vis medicatrix naturæ* in the shape of open-air treatment. Of fresh air he says that "of all the agents used in the sanatorium treatment, fresh air comes first and foremost." "The whole of the treatment is based upon it."

Of tuberculin treatment he truly observes that "the experience of medical men, gathered from many sources, goes to show that tuberculin injection has no specific value in the treatment of tuberculosis."

Strange to say, in view of his general attitude, he advocates the use of inhalation in the treatment of tuberculosis phthisis, and furnishes four prescriptions for inhalant mixtures.

He has something to say upon almost all the usual subjects recognized as having any bearing upon the causation, the prevention, and the cure of tuberculosis—subjects as diverse as housing conditions and auto-suggestion.

His views and his comments cannot be further considered here for lack of space, but, while differing from him radically on certain matters, we are fain to confess that his book is replete with information and suggestion, and well worthy of careful study.

P.B.

The White Cross of St. John.*

This is the third edition of Col. Blackham's lecture, which was first published in 1907. The lecture gives an historical account of the Order of St. John of Jerusalem, and the various buildings occupied by the Order in Palestine, Malta, Cyprus, Rhodes, France, Italy, Spain, Austria and England. The Order was dissolved by Henry VIII., but revived in 1827, and its ambulance work started in 1877.

Those who wish to study the history of the Knights will find many interesting particulars of the origin and objects of the Order.

The purchase of the old sixteenth century gatehouse at Clerkenwell restored a portion of the original headquarters in England to the Order, and forms a valuable link with the past.

Dr. N. Corbet Fletcher, M.B., Bc., has added a chapter on Notable Ambulance Dates and Facts, giving an outline of the splendid work done by the Ambulance Corps during the great war.

The little book makes a strong appeal for personal service and support for this excellent institution.

H.D.S.W.

* The White Cross of St. John, by Colonel R. J. Blackham, C.B., C.M.G., C.I.E., D.S.O., M.D. 8vo., 91 pp. London, 1921. Dale, Reynolds & Co., Ltd. Price, 3s. 6d.

MEETINGS HELD.

EXAMINATIONS.

Since the last issue the following examinations have been reported :—

Belfast, May 5th and 6th.
Manchester, May 12th and 13th.
Leeds, May 19th and 20th.
Liverpool, May 26th and 27th.
Cardiff, June 16th and 17th.

For Inspectors of Meat and other Foods :—

London, April 28th and 29th.
Birmingham, June 9th and 10th.

At these examinations 297 candidates presented themselves, and the following were awarded certificates :—

Sanitary Science as applied to Buildings and Public Works.

BRIGGS, JAMES TROKE, *Wakefield.*
CLARKSON, ERNEST HODGSON, *Horbury.*
LIVERSAGE, JOSEPH NORMAN, *Manchester.*
MOORE, LEWIS JACK, *Torquay.*
MORRIS, WILLIAM, *Withington.*
NAYLOR, FRED CROWTHER, *Pudsey.*
SMITH, CYRIL JOHN, *Newport, Mon.*
SWIFT, STEWART, *Stretford.*

Maternity and Child Welfare Workers.

LLOYD, EDITH MARY, *Yeadon.*

Women Health Visitors and School Nurses.

APPLETON, WINIFRED MARY, *Thirsk.*
BENNETT, GERTRUDE, *Leeds.*
BRAZIER, ELIZABETH ELLEN, *Leeds.*
CARR, MARION AMY, *Darton.*
CLANCY, AGNES, *Eccles.*
COBB, GERTRUDE ANNIE, *Leeds.*
COMPTON, ANNIE, *Haydock.*
CONSTABLE, CHARLOTTE, *Leeds.*
DAVIES, BEATRICE MAUD, *Llantwit-Vardre.*
ELLERINGTON, MARY ELEANOR, *Eccles.*
ELLIOTT, MARTHA SMITH, *Wetherby.*
FLEMING, MARY HANNAH, *Rochdale.*
FURMINGER, EVELYN HESSIE, *Manchester.*
GEE, AMENA NITA, *Todmorden.*
GRAY, GLADYS MARY, *Darlington.*
HINCHLIFF, MARY JANE, *Bradford.*
HUTTON, BEATRICE MAY, *Halifax.*
MARTIN, MARJORIE SINCLAIR, *Belfast.*
MATTHEWS, ROSA LOUISE, *Crumpsall.*
MCDERMID, KATE MILLICENT, *Darlington.*
MORRIS, PATTIE, *Hyde.*
OATES, ALICE, *Newport, Mon.*
SHOUT, MYRA, *Salford.*
SIMMONS, EDITH, *Manchester.*
OAKES, LOIS, *Belfast.*
ORAM, ELSIE REBECCA, *Halifax.*
ORR, MARY ELEANOR, *Belfast.*
OWEN, MARY CATHERINE, *Oldham.*
PRIESTLEY, SARAH EVELYN, *Bradford.*
ROBINSON, GERTRUDE EVELINA WHITELEY, *Cross Hills.*
ROBSON, MARY BROWN, *Halifax.*
SAVAGE, MARY, *Leeds.*
SNOWDEN, LILLIE, *Darton.*
WEBB, OLIVIA, *Bristol.*
WORSLEY, ANNIE, *St. Helens.*

School Hygiene, including Elementary Physiology.

ARMSTRONG, HENRIETTA GORDON, *Liverpool.*
BARKER, BERTHA, *Liverpool.*
BOYD, KATHLEEN WINIFRED, *Liverpool.*
CALVER, IDA JEANETTE MORRISON, *Liverpool.*
CAVANAGH, FLORENCE GERTRUDE, *Liverpool.*
CARDER, MOLLY, *Liverpool.*
COOK, HILARY, *Bedford.*
FIELDING, DORIS, *Liverpool.*
GANDER, DAISY IRENE, *Liverpool.*
GRANT, ETHEL MARION, *Liverpool.*
HOBKIRK, SYLVIA JEANETTE, *Liverpool.*
HODSON, CHRISTINE EDITH, *Liverpool.*
HOLFORD, CONSTANCE MADELAINE, *Liverpool.*
JAMES, PHYLLIS, *Liverpool.*
MCNAUGHT, MURIEL WYATT, *Liverpool.*
MYERS, GERTRUDE KATHLEEN, *Liverpool.*
NYE, VERA EILEEN, *Liverpool.*
OGDEN, WINIFRED MARY, *Bristol.*
PARKER, JEANIE SMITH, *Liverpool.*
POWELL, ENID MARY, *Liverpool.*
RAWCLIFFE, ANNIE, *Liverpool.*
READ, DOROTHY MARGARET, *Liverpool.*
ROBINSON, MARGARET ELEANOR, *Liverpool.*
SHARP, MARGARET DUFFUS, *Liverpool.*
SHARPLEY, EDITH MARJORIE, *Liverpool.*
SMUTS, MALIE, *Harrogate.*
WAGHORNE, GWENDOLEN MARY, *Liverpool.*
WILD, KATHLEEN, *Liverpool.*
WOODMAN, EMILY JANE, *Liverpool.*
YOUNGHUGHES, ELEANOR, *Liverpool.*

Sanitary Inspectors.

ALMOND, JOHN CHARLES, *Darwen.*
BAILEY, WILLIAM ASA, *Keighley.*
BARRETT, WILLIAM, *Street.*
BECKETT, JOHN LESLIE, *Liverpool.*
BIDDLE, WILLIAM JOHN HANCORNE, *Mumbles.*
BROOKS, RALPH, *Street.*
BURRELL, ALBERT JOSHUA, *Sheffield.*
BYATT, GEORGE JAMES BEECH, *Longton.*
COBB, CONSTANCE ISABEL, *Leeds.*
DALE, HAROLD WILLIAM, *Sefton Park.*
DAVIES, SARAH MAUD, *Swansea.*
DAVISON, JOSEPH, *Belfast.*
DENNIFF, EDITH, *Sheffield.*
DUPONT, HENRY JAMES, *Neath.*
EDWARDS, EVA MARY, *Blackley.*
ENTWISTLE, ROBERT MANGNALL, *Bolton.*
FACKRELL, JANE, *E. Kirkby.*
FEATHER, THOMAS, *Oxenhope.*
FOSTER, GEORGE KNILL, *Okehampton.*
GAGE, DOROTHY, *Axminster.*
GORNALL, LESLIE ASHWORTH, *Rawtenstall.*
GREENHOUSE, HAROLD JOSEPH, *Seedley.*
GRIFFITHS, EVAN JOHN, *Cardiff.*
HAZLETON, FLORENCE, *Sunderland.*
HOLMES, HARRY WILKINSON, *Skegness.*
HOOPER, JOHN GEORGE, *Llandilo.*
HORNBY, HAROLD, *St. Annes-on-Sea.*
HOUGH, HENRY THOMAS, *Wallasey.*
HUGHES, TREVOR, *Caerau Maesteg.*
KELLY, FRANK SCHOFIELD, *Horsforth.*
LEA, ERNEST, *Warrington.*
LEWIS PHILIP, *Pontyrhyl.*
MACMAHON, LETITIA, *Belfast.*
MICALLEF, PAUL, *Liverpool.*
NORRIS, ARTHUR, *St. Helens.*
OVERSBY, VINCENT, *Bradford.*
PARRY, WILLIAM ARTHUR, *Llandilo.*
PEARSON, ROBERT DEAN, *Darlington.*
PIZZUTO, ALFRED, *Liverpool.*

Ramsden, George, *Pontefract.*
Reynolds, Alfred, *Belfast.*
Smith, Florence L., *Swinton.*
Smith, John, *Wakefield.*
Turner, Thomas, *Stalybridge.*
Wade, Basil, *Castleford.*
Wilkinson, John Francis, *Sheffield.*
Williams, Tudor, *Pontypridd.*
Winfield, Robert Orchard, *Chellaston.*
Wood, Edwin, *Stockport.*

Inspectors of Meat and Other Foods.

Barnes, Alfred Edward, *Sparkbrook.*
Bill, Richard, *Stafford.*
Blackmore, Frank William, *Horsham.*
Callen, Vincent C. G., *Molesey.*
Chalcraft, William, *Walsall.*
Chant, David Robert James, *Cardiff.*
Crandell, William, *Wimbledon.*
Croker, C., *Capt. R.A.S.C., Devonport.*
Davis, Harry, *Redditch.*
Gray, Edward Henry, *Caversham.*
Kempton, Arthur Richard, *S. Norwood.*
Kilby, Bernard William, *Deptford.*
Knight, Alexander John Henry, *Capt., R.A.S.C., Glasgow.*
Male, Arthur, *London.*
Neale, William George Collingham, *Stoke Newington.*
Pearce, Harry Archibald, *Walthamstow.*
Prior, John Nelson, *Westerham.*
Reynolds, Alec., *Watnall.*
Richards, Edward John, *Rhymney.*
Smith, Victor Wynn, *Farnborough.*
Steeden, Edward James, *Leytonstone.*
Steele, Ernest, *London.*
Stubbs, John Bushby, *Capt.R.A.S.C., Kensington.*
Williams, Ivor Owen, *Dowlais.*

DOMINION AND FOREIGN NOTES.

We have had the pleasure of welcoming to the Institute :—

Mrs. Menyhért Szanto, of Budapest, who came to arrange for the display of an exhibit in the Museum, illustrative of Social Service in Budapest.

Alderman J. Soundy, of Hobart, Tasmania, who is making enquiries regarding Municipal Administration in England.

FORTHCOMING MEETINGS.

Lectures.

The Introductory Lecture to the Autumn Courses of Lectures will be delivered by Louis C. Parkes, M.D., D.P.H., on September 25th, at 5.30 p.m.

The Course for Sanitary Officers will commence on September 27th; for Health Visitors and Child Welfare Workers, on September 29th; for Meat and Food Inspectors, on October 6th; and for Army Officers and Professional Men on November 6th.

Sessional Meeting.

Cardiff.—Friday, October 13th, at 4.30 p.m., in the Town Hall, Discussions on "Health Education of Children," to be opened by J. S. Peebles, L.R.C.P., L.R.C.S., D.P.H., Medical Officer of Health, Bridgend U.D.C., and on "Open Air Schools," by E. E. Morgan, M.C., A.R.I.B.A., Borough Architect, Swansea. At 4 p.m., the Lord Mayor is kindly arranging to entertain the members and others to tea.

On Saturday, October 14th, visits will be made to places of local interest.

Health Week.

His Majesty the King, and Her Majesty the Queen, have graciously accorded their patronage to Health Week, which is to be held from October 8th to 14th. The Right Hon. The Lord Mayor of London has consented to act as Chairman of the General Committee.

Members of the Institute are invited to co-operate in promoting the success of the movement. Those prepared actively to assist are asked to send in their names to the Secretary.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Sanitary Inspectors, Maternity and Child Welfare Workers, Women Health Visitors and School Nurses, and School Hygiene, including Elementary Physiology, will be held at :—

Glasgow, June 23rd and 24th.
Birmingham, June 30th and July 1st.
London, July 14th and 15th.
Trinidad, B.W.I., July.
Derby, Oct. 13th and 14th.
York, Oct. 20th and 21st.
Manchester, Oct. 27th and 28th.
Melbourne, Victoria, November.

For Inspectors of Meat and other Foods :—

Leeds, July 7th and 8th.

BOURNEMOUTH CONGRESS.

THE THIRTY-THIRD CONGRESS OF THE INSTITUTE WILL BE HELD IN BOURNEMOUTH, FROM JULY 24TH TO 29TH, 1922.

PRESIDENT OF THE CONGRESS.

MAJOR-GENERAL THE RIGHT HON. J. E. B. SEELY, C.B., C.M.G., P.C., D.S.O., M.P. (LORD LIEUTENANT OF HAMPSHIRE).

Order of Proceedings.

SATURDAY, 22nd July, 1922.

The Congress Reception Room in the Municipal College will be open at 12 noon.

SUNDAY, 23rd July.

11.15 a.m. Service at St. Peter's (the Parish Church) attended by the Mayor and Town Council. Preacher, The Right Rev. The Lord Bishop of Birmingham.

MONDAY, 24th July.

1.0 p.m. Reception of Members and Delegates by HIS WORSHIP THE MAYOR. Public Luncheon, Town Hall. (*Tickets 5/- each.*)

3.0 p.m. Opening of the Health Exhibition in the Hants Drill Hall, by HIS WORSHIP THE MAYOR.

5.0 p.m. Inaugural Address to the Congress, by the PRESIDENT (MAJOR-GEN. THE RIGHT HON. J. E. B. SEELY, C.B., C.M.G., P.C., D.S.O., M.P., at the Town Hall.

THE RT. HON. THE EARL OF RADNOR in the Chair.

TUESDAY, 25th July.

8.15 a.m. Breakfast at the invitation of the National Temperance League, in the Lounge, Town Hall.

10.0 a.m. Meetings of Sections and Conferences in the Municipal College.

Section A.—Sanitary Science.

Conferences of Engineers and Surveyors, Veterinary Inspectors and of Health Visitors.

2.30 p.m. Excursion by Motor to the New Forest via Christchurch, Hinton to Wilvery Post. Separate here, and half of cars proceed via Brockenhurst, Lyndhurst, Lymington, Milford-on-Sea to Highcliffe Castle for

Garden Party. Second half proceed via Burley, Ringwood, Avon Valley, to Heron Court for Garden Party. (*Tickets 7/- each.*)

8.0 p.m. Popular Lecture, by Prof. Leonard Hill, M.B., F.R.S., at the Town Hall. The Earl of Malmesbury will preside.

WEDNESDAY, 26th July.

10.0 a.m. Meetings of Sections and Conferences in the Municipal College.
Section A.—Sanitary Science.
Section E.—Industrial Hygiene.
Conferences of Veterinary and Sanitary Inspectors.

1.15. Invitation of the Bournemouth Rotary Club to Luncheon at Princes Hall, Grand Hotel. (*Tickets 3/6 each, limited to 100.*)

2.30 p.m. Motor Excursions via West Cliff Drive, Canford Cliffs, Shore Road, for a visit to inspect the following works, and, by the kind invitation of the proprietors, tea will be provided :—

(1) Messrs. Thos. Wragg & Sons, Ltd., South Western Pottery, Parkstone.

(2) Messrs. Sharp, Jones & Co., Bourne Valley Pottery and Rock Concrete Tube Works, Parkstone (limited to 100).

(3) Messrs. Carter & Co., Ltd., Encaustic Tile Works, Poole (limited to 100).

3.15 p.m., return at 5.45 p.m. Alternative Boat Trip to Swanage. (*Tickets 2/3 each, exclusive of Pier Tolls.*) For Reception by the Chairman of the Swanage Urban District Council, A. C. B. Lloyd, Esq., M.A. (Limited to 100.)

8.0 p.m. Conversazione and Reception, by the Mayor and Corporation of the County Borough of Bournemouth, at the Town Hall.

THURSDAY, 27th July.

10.0 a.m. Meetings of Sections and Conferences in the Municipal College.
Section B.—Engineering and Architecture.
Section C.—Maternity and Child Welfare, including School Hygiene.
Section D.—Personal and Domestic Hygiene.
Conference of Representatives of Sanitary Authorities.

2.30 p.m. (1) Motor Excursion via Meyrick Park, Winton, Kinson, Canford Village to Waterworks at Wimborne and Alderney ; (2) Trip via Overcliff Drive, Branksome Park, Canford Cliffs, Sandbanks, Poole Park to Gasworks at Poole. (*Tickets 6/- each.*)
Reception and Tea by the Bournemouth Gas and Water Co.

8.0 p.m. Special Concert at the Winter Gardens, and Special Film on the Rat Pest and Extermination, kindly lent by the Vermin Repression Society.

FRIDAY, 28th July.

10.0 a.m. Meetings of Sections and Conferences in the Municipal College.
Section B.—Engineering and Architecture.
Section C.—Maternity and Child Welfare, including School Hygiene.
Conference of Medical Officers of Health.

1.0 p.m. Closing Meeting at the Municipal College.

2.30 p.m. Circular Drive via Boscombe Overcliffe Drive to Southbourne, Tuckton Corner, Carbery Avenue, King's Park, down Holdenhurst Road to Cooper Dean's Corner ; turn left to Kinson, Bear Cross, Newtown, top of Constitution Hill to Poole ; for Reception by the Mayor and Corporation of Poole. (*Tickets 6/- each.*)

7.30 p.m. Congress Dinner at the Grand Hotel. (*Tickets 10/6 each.*)

SATURDAY, 29th July.

10.30 a.m. Boat Trip (1) All Day Trip to Southampton. Invitation from the White Star Line to inspect the " Olympic," similar invitation from the Cunard Steamship Co. to inspect the " Mauretania," and tea will be provided for 500 by each company. (*Boat Trip Fare 7/- each, exclusive of Pier Tolls. Luncheon 5/-.*)

In lieu of the Boat Trip to Southampton arrangements have been made for those who would prefer to go by road for—

Motor Trip (2) via Christchurch, Lyndhurst to Southampton, returning via Rufus Stone, Ringwood to Bournemouth. (*Motor Trip Tickets 7/6 each. Luncheon 5/-.*)

All Motor Coach Excursions will start from the Municipal College (in the Meyrick Road), and Boat Trips from Bournemouth Pier.

The Bournemouth Corporation have granted facilities as follows :—

Golf.—Meyrick and Queen's Parks (links). (For further particulars please apply to W. H. Harrison, Esq., Branksome Hall, who has kindly consented to arrange details.)

Bowls.—Bowling Greens at Alum Chine, Argyll Gardens, Boscombe Cliff, King's Park, Knyveton Gardens, Meyrick Park, Southbourne and Winton Recreation Ground.

Tennis.—Courts at Alum Chine, Argyll Gardens, Boscombe Gardens, Central Gardens, Knyveton Gardens, King's Park, Meyrick Park and Winton.

Piers.—Free admission to Bournemouth and Boscombe Piers.

Trams.—Free use of Corporation Tramcars on production of Congress Tickets.

LIST OF MEMBERS AND ASSOCIATES

ELECTED MAY, 1922.

MEMBERS.

* Sanitary Science Certificate.
w Maternity and Child Welfare Workers' Certificate.
§ Sanitary Surveyors' (India) Certificate.
‡ Sanitary Inspector's Certificate.
m Meat Inspector's Certificate.
v Women Health Visitors and School Nurses' Certificate.
s School Hygiene Certificate.

4903	1922.	May	*COPPOCK, Vincent, A.M.I.S.E., *"Mayfield," Whitchurch, Cardiff.*
4904	1922.	May	*GOLDING, Harold Campbell, *81, Old Church Road, Clevedon, Somerset.*
4901	1922.	May	HASLAM, John Fearley Campbell, M.B., CH.B., D.P.H. (*Assist. M.O.H.*), *Government Public Health Department, Georgetown, British Guiana.*
4905	1922.	May	§KULKARNI, Tammaji Narayan, G.B.V.C., *Veterinary Surgeon, c/o Superintendent, Civil Veterinary Department, Bombay Presidency, Kalyan Veterinary Dispensary, Poona, India.*
4902	1922.	May	MAYNARD, Captain Charles Edward, *M.C.* M.INST.M. & C.E., P.A.S.I., *Engineer, Surveyor and Sanitary Inspector, R.D.C. Offices, London Road, Hailsham, Sussex.*
4906	1922.	May	§PILLAI, P. Velu, *Sanitary Surveyor, c/o Kesava Pillai, Neyyattinkara, Travancore State, India.*
4907	1922.	May	*RICHARDS, William John Rowe, *83, Mortimer Road, Kensal Rise, N.W. 10.*
4908	1922.	May	WANHILL, Lieut. Col. Charles Frederick, R.A.M.C.(R.), M.R.C.S., L.R.C.P., D.P.H., *Assist. County and School Medical Officer, The Shire Hall, Hereford.*

ASSOCIATES.

8780	1922.	May	‡AGER, Leonard, *15, Van Dieman's Road, Baddow Road, Chelmsford.*
8781	1922.	May	‡BARTLETT, Tom, *White Lion Inn, Brinklow., near Rugby.*
8782	1922.	May	‡BOWERS, Josiah, *22, Recorder Street, Swansea.*
8809	1913.	Feb.	‡CARGEEG, Raymond Arthur, *Labouchere Road, South Perth, Western Australia.*
8783	1922.	May	‡CHESTER, Miss Henrietta, *Greyland House, 13, Esplanade, Whitley Bay, Northumberland.*
8781	1922.	May	‡CLARKE, Herbert, *10, Jubilee Street, Nottingham*
8806	1922.	May	‡*m*CLINCH, Herbert George, *64, Blackwood Grove, Halifax.*
8807	1922.	May	*s*CODDE, Miss Eleanor, *20, Newport Road, Chorlton-cum-Hardy, Manchester.*

8808 1922. May ‡Cromwell, Edwin Oliver, *Edgehill, Holtwhites Hill, Enfield.*

8785 1922. May *v*Darroll, Miss Aileen Frances, *Leintwardine, Herefordshire.*

8786 1922. May ‡Else, Charles Glossop, *Park Lodge, Fritchley, near Derby.*

8787 1922. May *v*Gillett-Gatty, Miss Emma Katharine, *30 Retreat Place, Hackney, E. 9.*

8788 1922. May ‡Gower, Albert William, *" Chalfont," 7, Blenheim Park Road, South Croydon.*

8789 1922. May *m*‡Hey, Arthur, *2, Hastings Avenue, Bradford.*

8790 1922. May ‡Hill, William Ernest, *57, Meldon Terrace, Heaton, Newcastle-upon-Tyne.*

8791 1922. May ‡Hinchliffe, James, *The Castle, Town Bottom, Meltham, near Huddersfield.*

8792 1922. May *v*Husbands, Miss Thirza Isabel, *106, Humber Road, Blackheath, Kent.*

8793 1922. May ‡Jones, Reginald Alick, *104, Sangley Road, Catford, S.E.*

8794 1922. May ‡Keen, Charles Henry Holland, *Surveyor's Office, Minehead, Somerset.*

8810 1910. June *v*Knipe, Miss Sarah Caroline McCall, *2, Quentin Road, Blackheath, S.E. 13.*

8795 1922. May ‡McLeish, David Mitchell, *Balmalcolm, Kinrossie, Perthshire, Scotland.*

8778 1922. May Mitchell, Robert, *" Newcairnie," Lintrathen Gardens, Dundee, Scotland.*

8796 1922. May ‡Moore, Joseph, *42, Armstead Road, Beighton, near Sheffield.*

8779 1922. May Naug, Panna Laul, *Supervisor of Works, Drainage Department, Calcutta Corporation, 2/3, Sitaram Ghose Street, Calcutta, India.*

8797 1922. May ‡Paull, Charles Frederic, *2, Kelly Street, Auckland, New Zealand.*

8798 1922. May *v*Rhead, Miss Ethel Pearl, *14, Arodene Road, Brixton Hill, S.W. 2.*

8799 1922. May ‡Smith, Harry Kempe, *7, Glaskin Street, South Hackney, E. 9.*

8800 1922. May ‡Stevens, Ernest William, *4, Pulteney Terrace, Pulteney Road, Bath.*

8801 1922. May ‡Stevenson, Roland, *61, Beechhill Road, Eltham, S.E. 9.*

8802 1922. May *v*Symes, Miss Margaret Winifred, *Dorset Cottage, Wootten Grove, Sherborne, Dorset.*

8803 1922. May ‡Taylor, George Kaye, *66, Filey Road, Scarborough.*

8804 1922. May *v*Turk, Miss Daisy J., *Springfield Infant Welfare Centre, S.W. 8.*

8805 1922. May ‡Udell, Miss Florence Nellie, *Walnuttree House, Sudbury, Suffolk.*

ELECTED JUNE, 1922.

MEMBERS.

9094 1922. June BEDINGTON, Alfred Christopher, A.M.INST.C.E., P.A.S.I., *Salisbury House, Newquay, Cornwall.*

4910 1922. June BUMPSTEAD, Albert Dennis, A.R.I.B.A., P.A.S.I., *70, Heath Gardens, Twickenham.*

4918 1922. June *COOKE, Junr., William Levingston, *39, Mayflower Road, Clapham, S.W. 9.*

4911 1922. June DESBLEDS, Edouard Marc, A.M.INST.C.E., *Civil Engineer, Curepipe, Mauritius.* (*10, Southwold Mansions, Maida Vale, W. 9.*)

4912 1922. June GUPTA, Prafulla Kumar Sen, L.M.S., *Sebhati, District Khulna, Bengal, India.* (*Shakespeare Hut, Keppel Street, W.C. 1.*)

4923 1922. June, HAWORTH, Frederic George, M.B., C.M., L.R.C.S.E., D.P.H., (*M.O.H. and S.M.O.*), *Health Offices, Darwen, Lancs.*

4913 1922. June HUTSON, John, M.B.E., B.A., M.B., C.M., D.P.H., *Government Public Health Inspector, Harmony Hall, Barbados, West Indies.*

4914 1922. June ‡*m*JONES, David Phillip Walter, *Health Office, Shanghai Municipal Council, Shanghai, China.*

4919 1922. June *LIVERSAGE, Joseph Norman, *24, Crowthorn Road, Ashton-under-Lyne, Manchester.*

4915 1922. June LYNAM, Charles Roy, *Barthomley, near Crewe.*

4920 1922. June *MORRIS, William, *2, St. Brendans Road, Withington, Manchester.*

4921 1922. June *NAYLOR, Fred Crowther, *21, Whitelands, The Lanes, Pudsey, Yorks.*

4916 1922. June PRITCHARD, Harry Albert, *Sanitary Plumber and Heating Engineer, 5a, Great George Street, Park Street, Bristol.*

4917 1922. June SINGH, Man, C.B.E., B.SC. (GLASG.), B.A., *Dhan Lodge, Amjer (Rajputana), India.*

4922 1922. June *‡SWIFT, Stewart, *7, Sunny Side, Longford Park, Stretford, Near Manchester.*

ASSOCIATES.

8816 1922. June ‡ALMOND, John Charles, *48, Prospect Avenue, Darwen, Lancs.*

8814 1920. Oct. ‡BOWNASS, J. R. Zanazzi, *18, West Claremont Street, Stockbridge, Edinburgh.*

8817 1922. June ‡BREWSTER-GOW, Harold G., *Sanitary Inspector, Shanghai Municipal Council, Shanghai, China.* (*The Cottage, Herne Hill Mansions, Herne Hill, S.E. 24.*)

8818 1922. June ‡BURRELL, Albert Joshua, *90, City Road, Sheffield.*

8819 1922. June ‡BYATT, George James Beech, *145, High Street, Longton, Stoke-on-Trent.*

8820 1922. June ‡CULLIS, Miss Annie Louise, *195, Brook Hill, Sheffield.*

8821 1922. June ‡DUFFIELD, Reg.-Q.M.S., George Henry Edward, *The Depot, The Middlesex Regiment, Mill Hill, Middlesex.*

8822 1922. June ‡FEATHER, Thomas, *6, Hawksbridge Lane, Oxenhope, Yorks.*

8823 1922. June *v*FORSYTH, Miss Amy Millicent, *Quinish Tobermory, Argyll, Scotland.*

8824 1922. June ‡GREENHOUSE, Harold J., *21, Knutsford Street, Seedley, Manchester.*

8825 1922. June ‡HANLEY, John, *15, Potter Row, Edinburgh.*

8826 1922. June ‡HOLMES, Harry Wilkinson, *Prince George Street, Skegness.*

8827 1922. June *v*HUTTON, Miss Beatrice, M., *7, Clare Road, Halifax.*

8828 1922. June *v*JOHNSON, Miss Gwendoline Margaret, *148, Redland Road, Bristol.*

8811 1922. June LATIF, Mohamed, *Sanitary Inspector and Camp Officer, Bombay Improvement Trust, P.O. Dharavi 17, Bombay, India.*

8842 1914. May *v*MEADOWS, Mrs. Marion Florence, *Fields Hill, P.O. Kloof, Natal, S. Africa.*

8829 1922. June ‡MERKLE, Jonathan Keiller, *Sanitary Inspector, Sheet Anchor, County of Berbice, British Guiana.*

8830 1922. June *v*MERTENS, Miss Edith L., *Ingram House Club, Stockwell Road, S.W. 9.*

8831 1922. June ‡MOORE, Walter Alexander, *159, Brownhill Road, Catford, S.E. 6.*

8832 1922. June ‡NORRIS, Arthur, *54, Dentons Green Lane, St. Helens, Lancs.*

8833 1922. June ‡OVERSBY, Vincent, *18, St. Mary's Road, Laisterdyke, Bradford.*

8834 1922. June ‡PEARSON, Robert Dean, *40, Rockingham Street, Darlington.*

8835 1922. June *v*RUSSELL, Miss Marion T., *22, Mount Pleasant, Coteley, near Bilston, Staffs.*

8836 1922. June ‡SANDILANDS, John Whyte, *11, Albert Place, Leith Walk, Edinburgh.*

8812 1922. June SHEEHAN, Richard Greig, *Sanitary Inspector and Surveyor, Stewart Avenue, Bo'ness, Linlithgow, Scotland.*

8813 1922. June SINGH, Ram Rakshpal, *Overseer in charge of Sanitary Works, 316/L, Jamshedpur, District Singhbhoom, via Tetanagar, India.*

8837 1922. June ‡SMITH, John, *88, Pindersfield Road, Wakefield.*

8814 1922. June TAYLOR, Frederick Arthur, R.P.C., *22, Bury Street, Unthank Road, Norwich.*

8838 1922. June ‡WADE, Basil, *18, Medley Street, Castleford, Yorks.*

8843 1918. June *v*WALKER, Miss Marian E., *The King Edward VII. Order of Nurses, Dorothy Centre, Kroonstad, O.F. State, South Africa.*

8839 1922. June ‡WHITE, Reginald John, *2, Monmouth Place, Upper Bristol Road, Bath.*

8815 1922. June WHITNEY, Miss Florence Mabel, *11, Morella Road, Wandsworth Common, S.W. 12.*

8840 1922. June *v*WHYTE, Miss Anna Christine, *120, Domestic Street, Holbeck, Leeds.*

8841 1922. June ‡WORLEY, Walter James, *2, Navarre Road, East Ham, E. 6.*

OBITUARY.

It is with regret that the Council have to record the death of the following Honorary Fellow, Members and Associates :—

Hon. Fellow.—Charles Louis Alphonse Laveran, M.D., of Paris. He was the actual discoverer of the malarial parasite of man, and he devoted his life to research work, more particularly in relation to tropical diseases. He was a member of the Académie de Médecine and of the Académie des Sciences, an Officer of the Legion of Honour, and an Honorary Fellow of many Foreign Medical and Scientific Societies. In 1907 he was awarded the Nobel Prize for Medicine, and he was elected an Honorary Fellow of the Royal Sanitary Institute in 1911. For the past 25 years he had been engaged in laboratory work at the Pasteur Institute of Paris where he was a Professor.

Members.—Charles Samuel Beeston, of Ysceifiog, Holywell, who had been a member for 28 years.

Robert Lindsay, who was for many years the County Sanitary Inspector for Mid-Lothian. He had been a member of the Institute for 24 years.

Associates.—James William Fraser, of Port Chalmers, New Zealand.

Albert Macey, of Pengam, who had been an Associate for 27 years.

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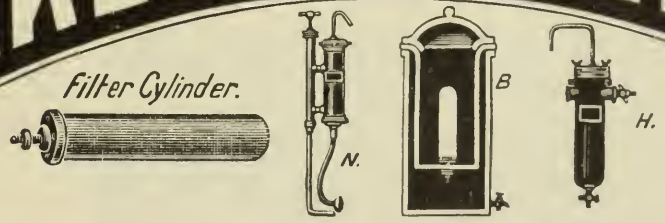

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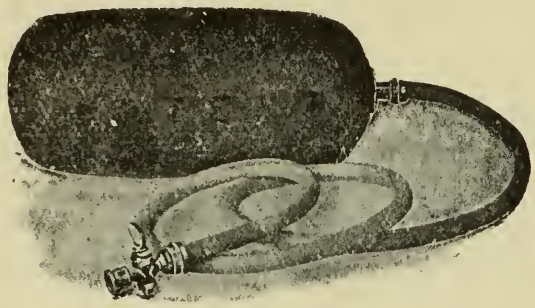

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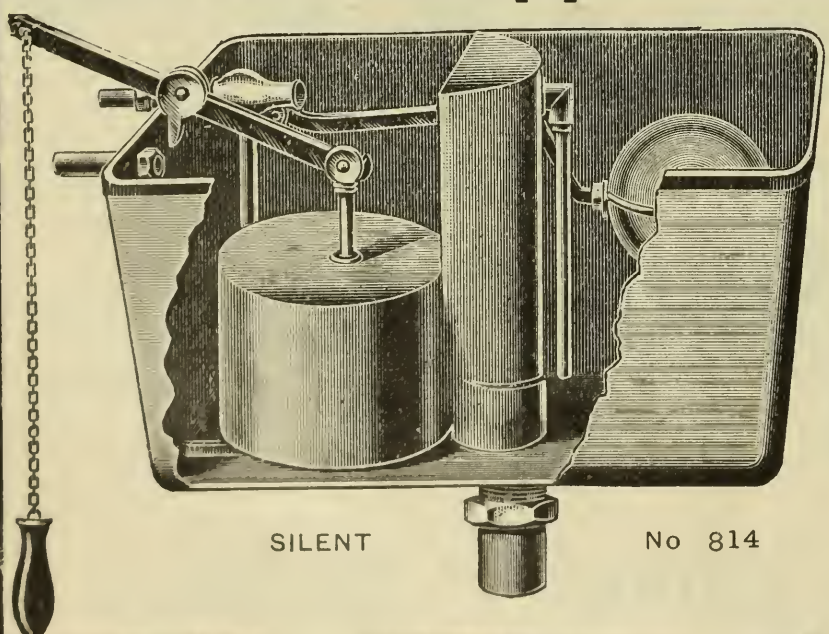

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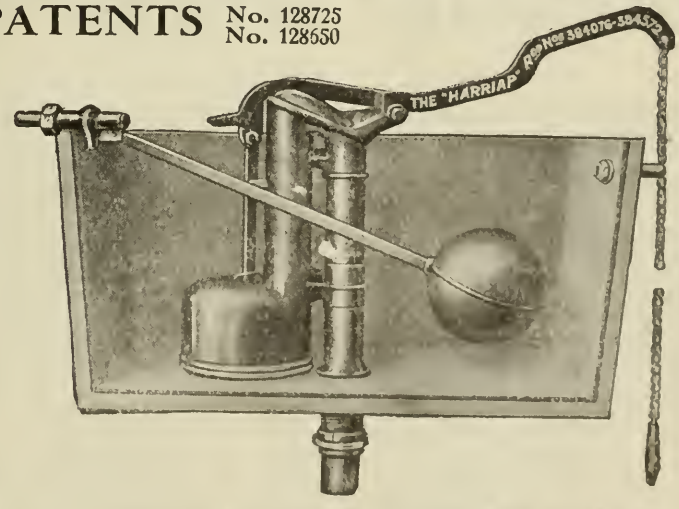

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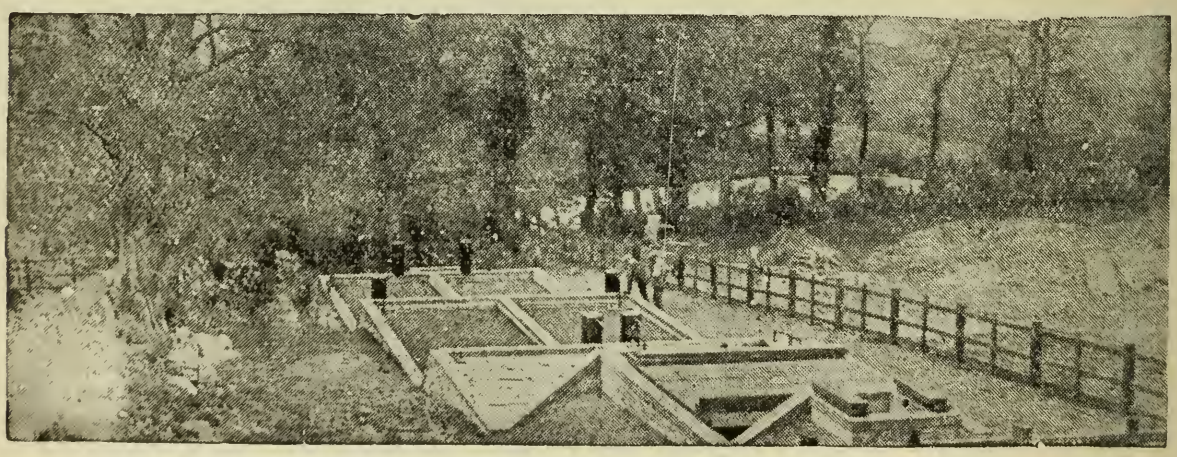

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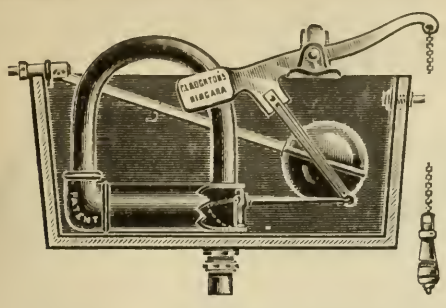

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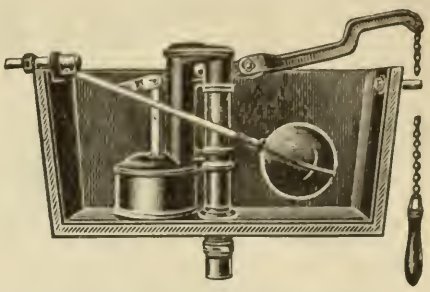

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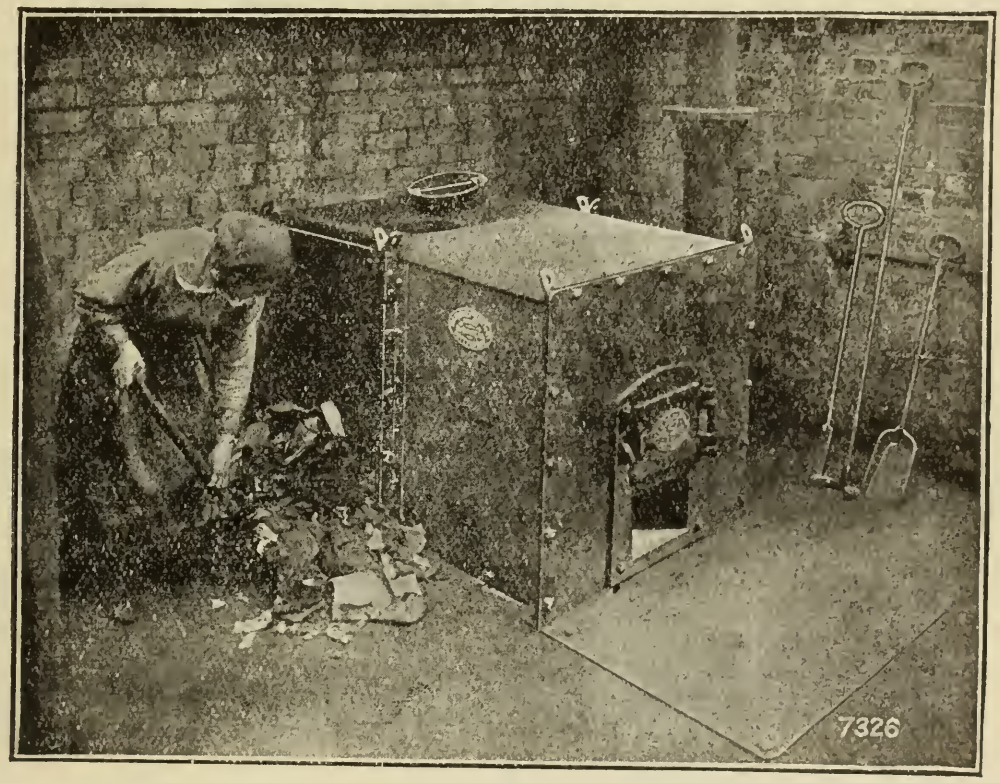

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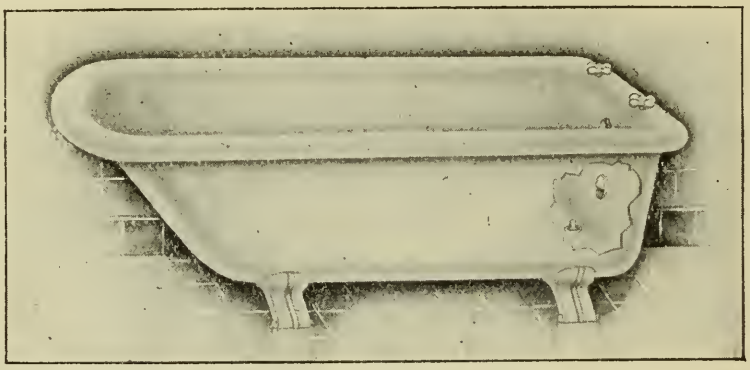

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Humane Slaughter of Animals for Food.

IMPORTANT DECISION OF THE LORD CHIEF JUSTICE. MR. JUSTICE BAILHACHE AND MR. JUSTICE SALTER, IN THE HIGH COURT OF JUSTICE ON JUNE 14th, 1922, WITH REGARD TO CLAUSE 9.B. OF THE MODEL BYE-LAWS, IN THE CASE OF DODD *v.* VENNER.

The Reading Magistrates' Decision.

Having given this matter careful consideration and weighed all the evidence put before us, we have come to the conclusion that the summonses against the four defendants should be dismissed. We find that the Bye-Law is unreasonable because it is partial and unequal in its operation as between different classes of the community. Further, we are of opinion that the Bye-Law is unreasonable because it applies to all animals without distinction, and we find as a fact, after hearing the evidence submitted to us, that killing pigs by hoisting and sticking is not less humane than by shooting. We also find as a fact that the meat of pigs killed for bacon purposes by a mechanically operated instrument is more likely to deteriorate for curing than is meat of pigs killed by hoisting and sticking. We also find that there is no material danger from a mechanically operated instrument if properly used with ordinary care. In dismissing the summonses we order the informant to pay ten guineas costs in each case. "THE READING MERCURY, *14th January, 1922.*

The Judgment of the Lord Chief Justice.

The Lord Chief Justice, in giving judgment, said that there was imposed upon the Corporation of Reading the statutory duty of making Bye-Laws for the licensing, registration and inspection of slaughter-houses and knackers' yards, and for preventing cruelty therein. A prosecution was instituted under Bye-Law 9, and in the result the Justices came to the conclusion that the Bye-Law was unreasonable on various grounds, which were set out in the special case. It had been suggested that the Bye-Law was bad in itself, (1) because it prescribed a particular method of slaughter when various methods were equally open to, or equally free from objection ; and (2) because on religious grounds, if that was the right expression to use, an exception had been made in the Bye-Law in reference to a particular portion of the community. In his opinion there was no substance in either of those criticisms. Applying, as he did, the principles laid down by Lord Russell in Kruse *v.* Johnson (*supra*) he could see no grounds whatever on which, so far as the law was concerned, the Bye-Law was open to objection. The appeal would therefore be allowed, with costs, and the case would be remitted to the Justices with a direction to them to convict. "THE TIMES," *15th June, 1922.*

Full particulars on this subject can be obtained from :—The Royal Society for the Prevention of Cruelty to Animals, 105, Jermyn Street, London, S.W. 1.

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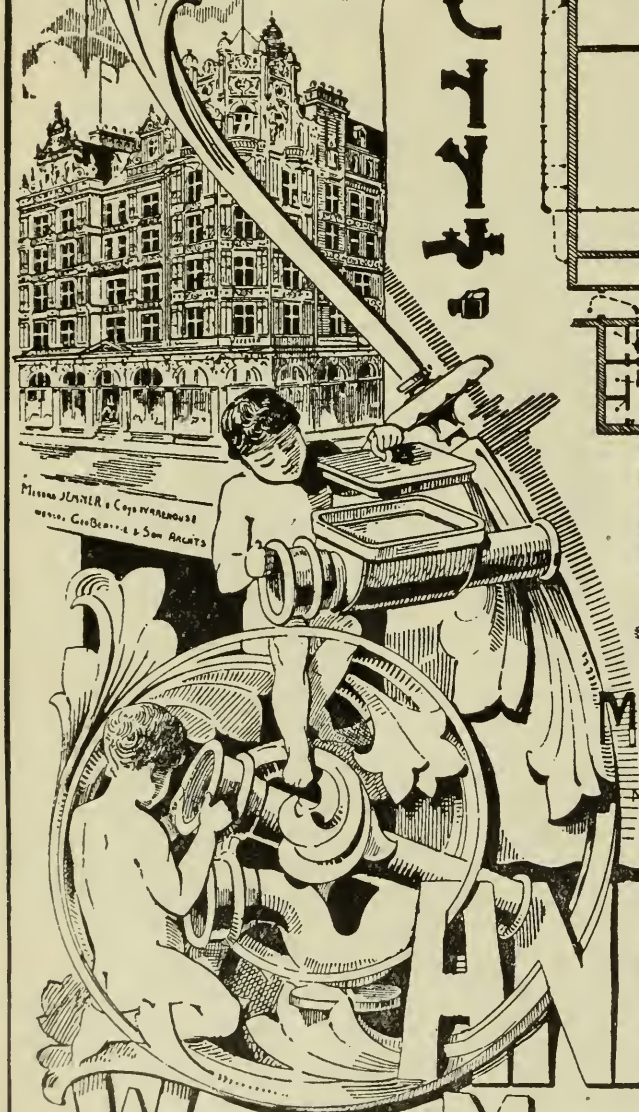

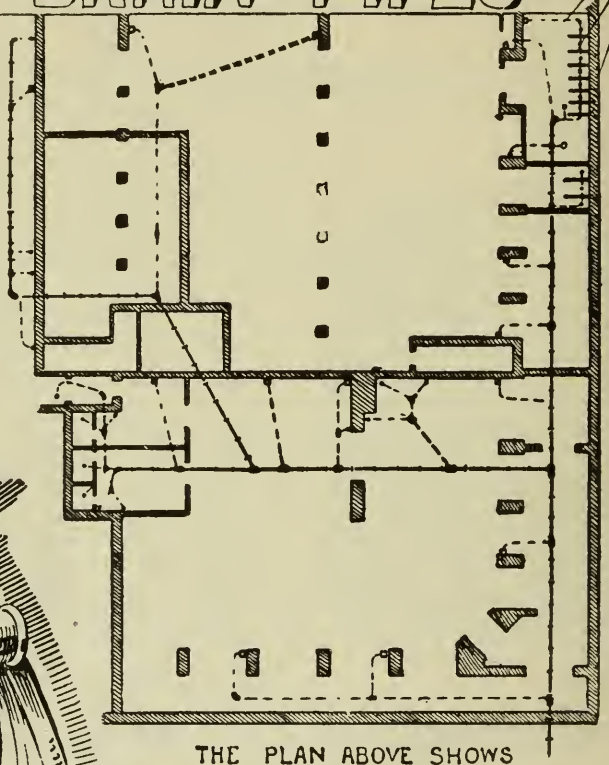

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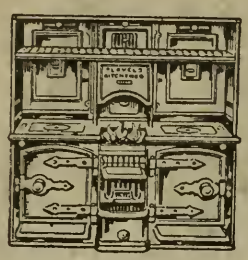

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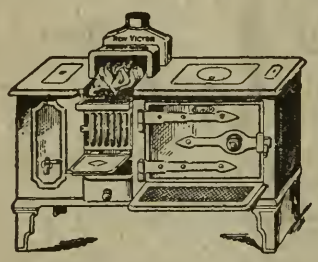

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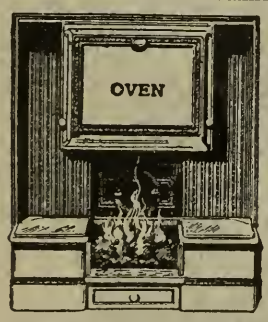

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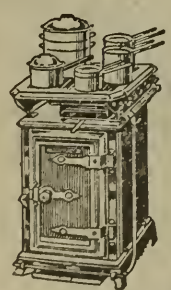

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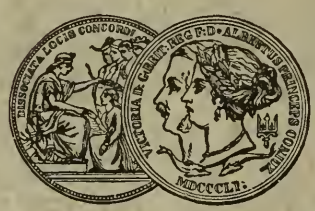

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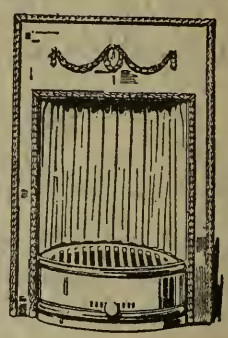

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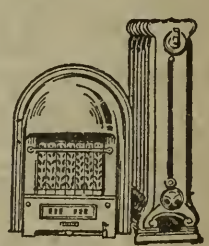

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